



Operating Without Pain.

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A desire to lessen pain is one that is natural to all, and the dental profession is surely not the exception. Any feasible and at the same time proved method that will bring to our equipment a means to this end is gratefully taken advantage of. This should not be because of any pecuniary advantage that might accrue to the operator, but rather because of the better position in which he is placed to serve those who may commit themselves to his services.

It has been suggested that as pain is believed to be of advantage to us as a strengthener of the physical and moral fibre, conversely the elimination of it from the preparation of cavities for our patients would weaken their powers of resistance and lessen the ability to overcome the control of fear. With the large majority of us it would seem that such an advantage would not stand against a presentation of the advantages accruing from a condition of ease and comfort on the part of the patient.

The reasons for desiring a field of operation that is devoid of pain are almost too obvious to call for enumeration.

**Advantages
of Painless
Methods.**

A little consideration, however, may serve to emphasize the advantages which will accrue through the use of any proven method by which such a condition may be brought about. From the patient's standpoint, the fact that the appeal is so often made to us to lessen that which so many have come to dread, serves to show how preponderating is that demand on their part. The appreciation that is shown when such a result is attained is practical evidence of a need.

To a very large degree the lack of proper care of the teeth through the services of the dentist is brought about through anticipation. The good which we all so desire to contribute to our fellows would be very largely enhanced if a revised opinion of the objectionable phases of dental work could be developed.

Further value of working without pain would have reflex value to the operator, even to the degree of lengthening his period of service. The majority of us are susceptible unfavorably when we are compelled to operate, and at the same time cause suffering to the one in our charge. We surely, therefore, give welcome to the means that have of late been offered to us that tend to produce to some degree this result. The special attempt in this paper will be to estimate the comparative value of these later accepted methods. Consideration will be given entirely to but two means that are now widely taken advantage of. A third one, that of local anæsthetic injections, has not been found serviceable to the degree requisite to the writer.

Comparison of Analgesia with Buckley's Desensitizing Paste.

Reference is herein confined to the analgesic state that is secured through the administration of nitrous-oxide and oxygen gases, and the effect produced by the application of Buckley's Desensitizing Paste.

This comparison is made after what is believed to be a sufficiently extensive use of both of these preparations.

Analgesia.

In the former case it is after a year of use following special instruction, in the latter a strict attention to the details of proper application and sealing in what should be as sufficient number of cases to form a reasonably fair judgment. Without, in the first case, questioning the effectiveness of either, it may be well to consider the advantages and disadvantages of each. Primarily in regard to application. In securing the analgesic state, the complete attention to cavity formation is permissible without delaying to a successive sitting to await effect, and the question of pain existing in the interval need not be considered.

Again it is an advantage that the very small apertures can be dealt

with even more favorably than the large. Where time and conditions afford it is possible to attend to an unusual number of teeth in the one sitting. The opportunity is given to produce and take advantage of anæsthesia where conditions develop that make such a severe proceeding as pulp exposure or removal desirable immediately.

The disadvantages of nitrous oxide and oxygen are readily enumerated. (1.) The fact that certain hours are most suitable for satisfactory service, and some times of the day objectionable. (2.) The advisable and somewhat objectionable preparation of the patient. (3.) The possibility of excitement or nausea interfering. (4.) The inconvenience caused by nose-piece, saliva and sometimes unfavorable situation of the head. (5.) The fear that is sometimes experienced on the part of a patient that is having an initial experience. (6.) On the part of the operator there may be a tendency to undue haste in consideration of the possibility of some unfavorable condition developing.

The writer does not consider the oft stated danger of accidental exposure as a disadvantage. A careful operator taking due regard to the physical and anatomical conditions will run no more risk than in the ordinary procedure.

Referring now to the Buckley Paste.

**Buckley's
Paste.**

Its good qualities in regard to application may be stated as follows: A ready acceptance on the part of the patient. A clear field of vision for instrumentation. The continuance of insensibility over a sufficient period to make attention at a later sitting a matter of ease. The opportunity afforded for deliberativeness gives assurance of essential preparation.

This very admirable compound has at the same time conditions sometimes attendant upon it that detract from its value. (1.) The necessity of procuring some retentive form of carious portion of the tooth for its sure sealing is sometimes, to say the least, uncomfortable. (2.) The impossibility of application to minute points of decay, especially when approximately located or if extending beneath the gum margin. (3.) The difficulty of absolute marginal sealing even with the most adhesive cements in some forms of cavities. (4.) The danger of applying to places where caries is more extensive than realized and which should have had applications preparatory to removal of the pulp. (5.) The frequent exhibition of discomfort and sometimes pain during a greater or less amount of time during which the drug is confined. (6.) The oversensitiveness of some teeth for a period beginning some days after the completion of the work. These comparisons made between these two methods have not as yet taken into consideration the effectiveness of either. Such consideration will now be given basing statements upon results attained



Items of Interest

through the year's experience with analgesia and in seventy-five cases in which the paste has been applied. In connection with the former a wide range of patients of diverse types have presented, an assistant rendering service and an earnest endeavor being made to attain the most satisfactory results.

In using the paste great care was manifested to follow directions, except that Ames C. & B. Cement was used in preference to the temporary cement advised, to assure most positive retention.

Reverting to analgesia and its service, space would not permit complete data, but suffice it to say that in over ninety per cent. of the cases in which it has been undertaken, sufficient success was attained to meet the approval of both patient and operator.

References to cases which have not reached the standard desired or which have developed peculiarities are not without interest and are therefore mentioned.

Case 1. Male of forty years. Administration an hour after meal. Vomiting after ten minutes of analgesic state. Recovery rapid. Patient claimed that unusual cup of coffee was largely responsible. Only two other patients have had this experience.

Case 2. Married female, exhibited hysteria in form of loud laughing and talking. This continued all through the experience, but at conclusion no complaints were made.

Case 3. Nurse; just released from exhausting case; apparently suffered intense pain and almost collapsed, but on recovery expressed more objection to drying out of cavity than any part that had preceded it. Three others showed every sign of the usual pain but, while having the memory of it, contended that it was not objectionable and would use no other means at future times.

Case 4. Was the one case that in spite of almost the absolute anæsthetic state yet was just as susceptible to pain, according to the story told.

Case 5. Was that of a young married woman who intended to have the analgesic effect three days in succession, but after the second was nauseated and depressed for several hours, and so preferred the usual methods on the final day. As a result of this experience it is felt that it is wise to let several days intervene between sittings for such a purpose.

No other cases can be referred to that seemed to manifest unusual



results. So far then as effectiveness in regard to the reduction of sensation is concerned, it is stated in all sincerity that the production of the analgesic state is, when carefully administered, qualified to produce almost sure results. Some of the objections such as timidity and the preparation of patient (which latter can be largely anticipated at home), will be gradually done away with as knowledge respecting the process is more widely known.

It should be borne in mind in comparing the two methods dealt with, that nitrous oxide and oxygen is effective very largely in connection with pyorrhea treatment, while, of course, the paste requires a cavity for introduction.

It could also be mentioned along the same line, that in cases where formation is to be made in a sound tooth for an inlay for bridge retention, that it is obvious that paste cannot be applied.

At the same time it has been found an excellent expedient to seal in the paste after the preparation of a cavity with analgesic assistance, when such is to be temporarily filled until a later sitting. Previous to this knowledge it had been found that on return there had often been very objectionable sensitiveness.

**Experiences
with Buckley's
Paste.**

The following is a careful review of the cases in which Buckley's paste has been resorted to:

Seventy-five successive cavities are referred to, dealing, of course, with a lesser number of patients.

Care was used to secure the best results, and at least it can be stated that average ability was shown so that the results are not any less good than would be found by the average workman.

Of the cavities prepared twelve were small approximal cavities in lower incisors, and of these nine showed very poor results. Only one was really effective.

Others approximately located but in other parts of the mouth gave thirty-four successes out of forty.

Buccal or labial efforts were successful in practically sixty per cent. of cases and occlusal apertures where it was possible to attain margins that assured sealing effectively were in every case sure in results.

It was easy to judge that absolute success was most to be expected where the walls were definitely outlined, and where this was very difficult without painful cutting away of margins the outlook was correspondingly doubtful. The small proportion of successes in the lower incisors is accounted for in this way.

It has been noticed and remarked upon by patients that it would seem that a slight discomfort during the interval presages desired results.



Items of Interest

On more than one occasion, particularly in teeth of a mother and son, severe pain was experienced for the better part of twenty-four hours.

In one case, through failure to keep an appointment, the application remained in one tooth for a week and then dropped out, but in spite of being open for another week the results were good. A neighboring tooth, however, in which the application seemed to be still well retained, needed a further dose. Still more remarkable was that of two upper laterals which, through sickness, had retained treatment for five weeks and there was still the desensitizing effect.

On four occasions after removal of caries following the paste, exposure developed, but there had been little discomfort in the interval and seemingly the extirpation of the pulp was facilitated.

So far as permanent deleterious pulp effect is concerned, it is necessary at this date to rely on the assertions of Dr. Buckley, and the writer has confidence that such will not develop or he would not be a user of it at the present time.

Conclusions. The conclusions drawn from an unprejudiced consideration of the cases dealt with in both of the methods under review, lead to the positive opinion that they are very valuable contributions to both patients and operator, but that neither can be relied upon at all time to perform the desired service.

Each seems to have particularly favorable conditions that anticipate surety of effects, but at the same time each will develop unanticipated failures.

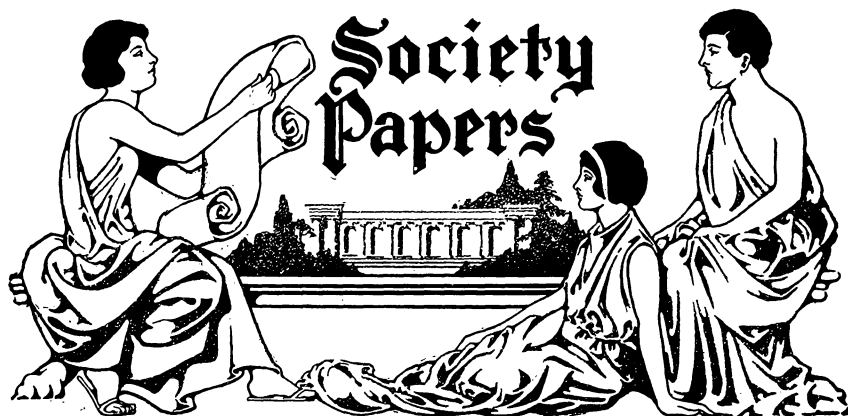
In neither case is overconfidence advisable, and both require carefulness to the last degree.

It has been shown that there are various conditions unfavorable for each, and judicious selection, when either is called for, is necessary.

In cases where there are no cavities existing, or where so minute or inaccessible as to make sure sealing impossible, then it is apparent that resource to paste application is unwarranted.

In cases of unwillingness on the part of the patient, or where physical or mental disability exists, analgesia cannot be proceeded with properly.

There will, therefore, be times when, in spite of both of these admirable expedients, conditions will present when we will be compelled to continue doing the best we can with such other aids as are available.



Root Canal Preparation.

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Read before the Second District Dental Society, Brooklyn, N. Y.

It is certain that much may be judiciously argued in favor of the drill, or of chemical and mechanical treatment for root preparation, and there is something to be said against each agent or combination of agents, and that is what, on the present occasion, I have to say.

To state one argument is not necessarily to be deaf to all others, and that a man has written a book of travels in Russia is no reason why he should never have been to Africa.

But a comparatively short time ago, before the invention of matches, in the days of our forefathers, neighbor would go to neighbor asking: "Lend us fire." I have traveled hundreds of miles to ask of you, our neighbor: "Lend us fire, to relight and keep our torches burning, to give us courage, to give us patience and endurance and wisdom to the end that we, who are giving the best that is in us to this yet unsolved problem, may be able to report progress in answer to the eager and earnest inquiries of our confrères throughout the world."

Whether it be a tooth from which a devitalized pulp is to be removed after arsenical application or pressure anaesthesia, or the opening and cleansing of a pulp canal that shows a moist or dry gangrenous tissue, or any or more of the numerous pathological pulp condition or conditions beyond the root end, the goal, the strategic point, is the apical foramen or foramina: foramina in ninety per cent. of adult teeth.

It is then the duty of the operator to obtain a sterile and as direct and as free a passage to the strategic point as the nature of the root

canal will permit. It does not meet the present day requirements to say, as do some of our text books and essayists, "open the root canals to the end." Our inquiry is, how is this seemingly simple little thing to be done?

To undertake the opening and preparation of a root canal should indicate that the dentist recognizes the necessity for removing every atom of devitalized tissue, having the canal throughout its entire length and in all of its ramifications, including the dentinal tubuli sterile and in such shape and condition that the canals, the tubuli, the foramina may be permanently sealed or filled.

Diagnosis, filling of canals or treatment of conditions around and about the root, are not to be discussed farther than may be necessary to make clear the reasons for certain steps to be mentioned.

The dentist should on every possible occasion avail himself of the advantage to be obtained through having one or several radiographs before him for comparison or study. We cannot be reasonably sure of the effectiveness of our efforts without such assistance, nor can we be absolutely certain with them. Many of the pictures thrown on the screens and printed in our journals as evidence of perfect technic and results are about as clear as rabbit tracks in the snow on a windy day, when it is a difficult matter to determine whether brother rabbit is going or coming, the strategic point being conspicuously absent. Improved apparatus and technic will some day overcome these shortcomings. Inasmuch as the largest number of dentists are for one reason or another deprived of the valuable assistance of the X-ray, and our literature is being surcharged with most accurate information in this line, let us then on the present occasion keep in mind the great majority who get along the best way possible without this expensive adjunct.

**Aseptic Operation
Recommended.**

All operations upon the root canal from beginning to completion are purely surgical and should be conducted upon surgical principals; this being true, the maintenance of aseptic conditions is of first importance.

Radiated heat and superheated steam in combination is the only acceptable method for the sterilization of instruments, cotton, paper points, gutta percha points, etc.

Steam chests that are best adapted to this use are known as the Pentz System, made by the Santiseptic Manufacturing Co., Tompkinsville, N. J., and a double chambered steam chest made by the Wilmot Castel Co., of Rochester, N. Y.

**Opening into
Pulp Chamber.**

The opening of the pulp chamber should be accomplished with as little disturbance of the devitalized pulp tissue as may be possible: to this end it will be well to cut through the dentin with a drill, then use carborundum disks and stones, keeping the carborundum stones moistened with water that contains a liberal supply of carborundum powder. This enables the stone to cut rapidly without heating the tooth.

Better results will be obtained if, while using the stones and carborundum powder, all of the tooth crown be removed that interferes with pulp chamber enlargements that may be necessary in getting direct access to the end of the root.

Sufficient enamel and dentin having been removed to give a clear view of the pulp chamber, it will be well to prepare for the placing of the rubber dam, by means of threads, fine polishing strips, separators or by whatever means necessary to insure the dam going to place with little or no forcing. There should be no leakage whatever about any of the teeth included in the field of operation.

**Copper Band to
Facilitate Use
of Rubber Dam.**

If the cavity margin reaches to or below the gum line then a copper band should be fitted and cemented to place about that tooth, so that the dam and clamp can be placed upon or over the band and tooth without danger of displacing the band. The fitting and placing of the band will be described with the illustrations that follow this paper.

**Removal
of Pulp.**

The dam being in place, bathe the exposed teeth, rubber dam and clamp, etc., with a seventy per cent. alcohol solution or tinct. iodine. This strength of alcohol is a more effective germicide than the ninety-five per cent. generally used. With warm air dry the cavity: with small fissure drill make a circular cut, leaving a cap of dentin over the pulp chamber which may be removed by a blast of air or a fine excavator. Having exposed the pulp it will in many cases be well to toughen or harden the pulp tissue by placing a drop of alcohol and formalin (about five per cent. formalin) on the devitalized pulp for a few minutes. Then with hot air dry the pulp, when a fine broach is passed along side the pulp or largest branch of the pulp. Slightly turning or rotating the broach and withdrawing the broach, will in many cases bring the entire pulp including the smaller branches of molar pulps.

Every possible effort should be made to get the entire pulp at the first trial. The extracted pulp should be spread on white paper and examined with a magnifying glass that the operator may know the location of pulp fragments if there be any.

**Cleansing
Canals.**

The three methods of procedure, from this point, that we wish to discuss briefly are: the drill, the sodium-potassium, and the sulfuric acid and soda bicarbonate.

The open chamber and canals should first be washed out with normal saline solution; dry, then place shred of cotton saturated with clove oil well within the large or open canal to remain while we go in search of the very minute canals that may be so small that it is a difficult matter to find them.

**Use of
Canal Drills.**

Paint the floor of the pulp chamber with tincture of iodine. When the surplus iodine is absorbed by a cotton pellet little dark spots will, in most cases, reveal the location of the canals. The finest Kerr drill, manipulated by hand, without pressure, will enter a very fine canal by gently rotating the drill, and being very delicate and flexible and threaded like a screw, will in most cases bring away the remaining pulp tissue, when the canal may be enlarged by gradually increasing the size of drills, or the drills may be worked in and out of the canals as files.

These flexible drills will go around a slight curve if the canal is large enough to give the instrument free play. If the instrument binds, at or near the curvature, a false pocket will be made on the outer wall of the canal at the curve. This little pocket or pit in the dentin, at the point indicated, prevents further instrumentation within that canal.

Each and every root canal is more or less of a law unto itself. A correct radiograph is of inestimable value. In the absence of the X-ray picture, the operator will be greatly assisted by making a pencil sketch of the probable shape of the tooth. In this way his memory will be refreshed and he will be made more keen and alert as to the probable difficulties ahead.

In some cases it may be of advantage to sink a shaft in the root using a bud drill, following the fine canal from a third to a half the length of the root, following the canal from this point with the fine flexible drill.

By being patient and careful many of the finer canals may be opened to the foramen.

It is possible, however, that septic matter or pulp fragments that may become septic, have been forced through the foramen into the apical space.

It is not possible that the multiple foramina, or the collateral canals, or the connecting canals or the flat thin cancellous spaces between the main canals in double roots have in any sense been opened or cleansed.

The drills in many such roots have simply drilled holes through or-

ganic substance in various stages of disintegration. Such substances cannot be washed or swabbed out but are left within the canal, sometimes saturated with such antiseptic medicaments as may be applied, and finally incorporated with the root canal filling.

**Sodium-Potassium
Method of
Cleansing Canals.**

Schrier's kalium-natrium, or sodium-potassium as we more frequently name it is a concentrated alkali caustic; explosive when in contact with water, yet a most useful agent when carefully and skillfully handled, for the purpose of removing organic substance from root canals. It is also a useful adjunct for opening and enlarging root canals after the manner advocated by Drs. Rhein and Ottolengui.

If the dentist will moisten a spot of skin on the back of his own hand and place thereon a small particle of sodium-potassium he will realize at once the necessity of giving close attention to the protection of the patient, including the nostrils which should be protected in some way.

All the pulp tissue that is within reach of the broaches having been removed, small particles of the sodium-potassium, size of a pin head if placed where the very fine canals should be, the dentin being moist will, by dissolving the organic substance, reveal the elusive anterior canals of lower molars or buccal canals of upper molars. These canals after being located and having been exposed to the action of the sodium-potassium for a few minutes, should be attacked with what has been named "picks," Dr. Rhein having devised a very efficient instrument under this name. An instrument will be illustrated later that has the advantage of being more rigid and also having interchangeable points.

These picks, with assistance of the sodium-potassium, which breaks down the organic matrix of the dentin, converting it into a soapy-like mass, which acts as a lubricant, will work their way into the canal, enlarging and sterilizing in a most satisfactory manner.

After advancing a distance into the canal, if the pick begins to bind or lock, thereby becoming a piston within the canal, a large Gates-Glidden drill, from which the point has been ground, may be used to enlarge the lumen of the canal so that the pick may work more freely.

When having reached the region of a curve in the canal or a near approach to the foramen, it will be safer to use a finer instrument, a Donaldson broach, from which the barbs have been partially removed, for the purpose of negotiating the curve if possible; also to eliminate as much as possible the piston effect of the larger instrument that might force the caustic contents of the canal into the region beyond the foramen, and do damage that will be difficult to control.

I have had two severe burns in my practice from this cause. In one case the tooth had to be extracted, and the second one I fear will be lost.

Caustics. Chemical substances which cause death and degeneration of tissues are called caustics.

Alkalies, such as sodium-potassium and calcium. Acids, such as hydrochloric, sulfuric, nitric, arsenious and carbolic, and the salts of some metals, such as silver nitrate, zinc chloride, copper sulphate, are the most common types of caustics.



Fig. 1. Copper band cemented on tooth to facilitate the placing of rubber dam where the cavity extends below the gum margin.

The alkalies and metallic salts act by uniting with the albumins, acting as albumin solvents.

"The caustic alkalies are not self limiting: they penetrate deeply into the tissues and destroy the albumin of the mucous surfaces, the horny tissues and the external skin."

Necrosis, followed by eschar formation, is caused by strong caustics, the necrosis involving tissues at various depths, depending upon the strength of the caustic, the nature or mode of its action, and the time it is allowed to act.

"Those agents are best suited for cauterization which, like concentrated sulfuric and fuming nitric acid and silver nitrate, penetrate to the deeper layers of the skin and mucous membrane only after acting for some time."

The treatment of chemical injuries, of *recent cases*, should be directed toward neutralization of the agent before it penetrates deeply.

Chemists and apothecaries usually have two solutions ready. Acetic acid or vinegar is used to neutralize the alkalies, while a solution of sodium bicarbonate is used to neutralize the acids.

If, for any reason, it is suspected that sodium-potassium has passed beyond the foramen, a sulfuric acid solution should be applied quickly, followed by soda bicarbonate solution.

I have no doubt that through some of the large foramina, at least, the caustic alkali has wrought harm.



Fig. 2.

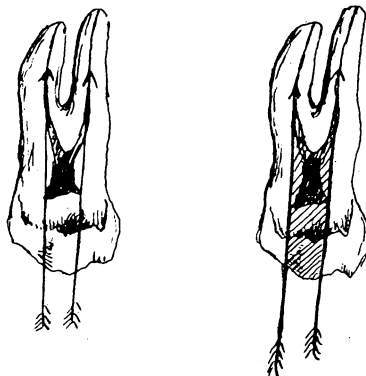


Fig. 3.

Fig. 2. Showing curvature of buccal roots of upper molar.

Fig. 3. Shows amount of tooth structure to be removed to get as nearly as possible in a straight line with the foramen.

In the constricted canals and in the constricted apical region the use of sodium-potassium is frequently indicated. The dangerous qualities of a valuable agent should not cause us to overlook its useful qualities.

Sulfuric Acid Method of Cleansing Canals.

Twenty years ago sulfuric acid solution and soda bicarbonate solution came into use.

The sulfuric acid is used for the purpose of softening the surface of the pulp canal walls to permit the passage of the barbed or roughened broaches to and fro through the canal, enlarging the canal by breaking loose the softened dentin. Soda bicarbonate solution is thereupon injected into the canal that the broken down dentin and other disorganized substances may be removed from the canal by effervescence caused by the escape of carbonic acid gas that is the product of the neutralizing action of the soda bicarb upon the sulfuric acid.

This reaction leaves the canal in a state of surgical cleanliness. This cannot, to my knowledge, be said of any other method or agent.

Twenty years is a long time for a method or theory to stand practically unaltered. Notwithstanding the age of the so-called sulfuric acid treatment (which might much better have been entitled, "Sulfuric acid and soda bicarb treatment"), a brief résumé of the theory and practice of the doctrine may not be amiss.



Fig. 4.

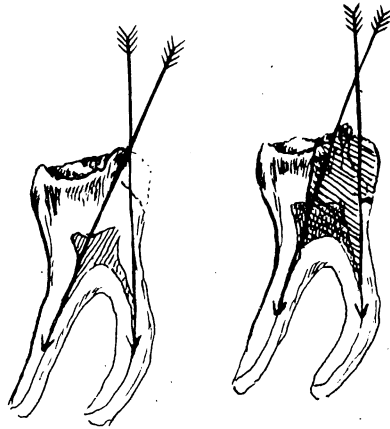


Fig. 5.

Fig. 4. Showing curvature of roots of lower molar.

Fig. 5. Shows the necessity for the removal of a large part or possibly all of the crown of the tooth in order to get by this always difficult and many times impossible class of root curvatures.

Concentrated sulfuric acid is also an active escharotic. The acid caustics act by burning the structure with which they come in contact.

They not only disintegrate albumen but attack many other organic substances. The breaking up of inorganic and the carbonization of organic substances is to be borne in mind.

Diluted and mild caustics, when applied, cause an inflammatory action, depending upon the strength and time of application.

A fifty per cent. (by volume) solution of sulfuric acid will soften cotton on the carrying instrument. A weak acid solution gives a correspondingly weak reaction in the presence of the soda solution.

The strength of the acid solution should be not less than twenty per cent. and not above forty per cent. for root canal work. In my own practice thirty per cent. to forty per cent. aqueous solution or commercial sulfuric acid by volume is the standard.

Soda bicarbonate should be a saturated solution.

In relation to the action of the acid solution on bone tissue, Mr. George Pollack, F. R. C. S. Surgeon to St. George's Hospital, says: "Dilute sulfuric acid does not affect the living, acting chemically on diseased bone alone." He gives the following experiments: "Portions of dead disease and healthy bone were selected and subjected to the action of sulfuric acid."

- viz: No. 1. Dead bone 10 grains
 2. Diseased bone 10 grains
 3. Healthy bone (middle age).. 10 grains
 4. Healthy bone (old age)..... 10 grains

"Exposed to the action of a mixture of sulfuric acid and water one part in four, for three days, at a temperature of one hundred deg., the following were the results:

No. 1. Dead bone, phosphate of lime 2 grs. Carbonate of lime 3.3 grs. dissolved in the mixture.

No. 2. Diseased bone, phosphate of lime 2 grs. Carbonate of lime 1.3 grs. dissolved in the mixture.

Nos. 3 and 4. In both specimens of healthy bone no action took place."

Dr. Garretson, in the treatment of caries of the maxilla, recommends the use of the officinal ordinary sulfuric acid.

On the diseased or partially disorganized soft tissues the solution will have a corrosive and astringent effect, or in other words, will break down or destroy the diseased tissue, leaving a fresh, clear field for nature, with the assistance of mild antiseptic treatment, to take care of herself.

Why does not sulfuric acid attack and destroy devitalized dentin? The acid at first attacks the tooth substance, breaking down the lime-salts, at the same time corroding or carbonizing the organic substance, forming a new compound, thereby establishing a barrier to the further progress of the acid.

Prof. Cassidy, see *Dental Chemistry and Materia Medica*, says: "The acid attacks the earthy portion forming insoluble calcium sulphate (Ca So_4), at the same time dehydrating the animal or gelatinous portion, which is mainly made up of carbon, hydrogen and oxygen. These two latter elements are withdrawn as already alluded to, leaving the indestructible carbon as a residue to be incorporated with the insoluble sulphate, producing thus, a protecting covering to the unaffected parts beneath, against further inroads of the causing agents."

This protecting covering of carbon and calcium carbonate are re-

moved or scraped away by each excursion of the rough broach, permitting the acid to take another bite at the dentin.

The same chemical and mechanical action is repeated so long as the broach is kept in motion in the presence of the acid solution.

The depth to which the acid affects the dentin is, unfortunately, immeasurably small.

It would be a great advantage to the work in hand if the acid would or could be made to penetrate further into the dentin. The reason why

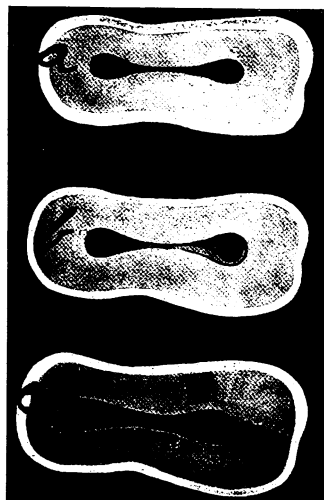


Fig. 6.

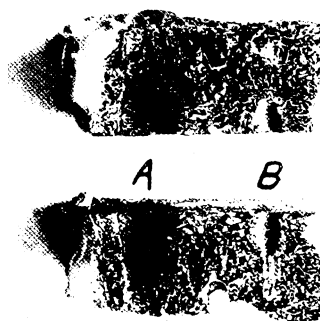


Fig. 7.

Fig. 6. Transverse sections of large flat root. *A*. Canal filled with disorganized pulp tissue. *B* Attempt to clean canal with drills and broaches often digs a passageway through the disorganized canal contents. *C*. By chemical methods every vestige of organic tissue may be removed.

Fig. 7. *B*. Self-limiting action of sulfuric acid solution on cancelous bone tissue. *A*. Action of sodium potassium on same bone.

a larger area of the dentin is not at once affected has already been mentioned. It may be well to recall, however, that dentin consists of an organic matrix, a reticular tissue of fine fibrils richly impregnated with salts of calcium. Traversing the matrix are long, fine canals or tubes, the dentinal tubules, twenty-five to thirty thousand to the square millimeter. Immediately surrounding the tubules the matrix is especially dense, forming a lining or sheath to the tubes, known as the dentinal sheaths or Neuman's sheaths. Neuman's sheaths are insoluble in boiling sulfuric acid.

**Method of
Applying Acid
in Canals.**

Sulfuric acid causes delicate steel instruments to become brittle and to break on small provocation, leaving small pieces of steel buried within the canal. This unpleasant accident is, as a rule, due to the manner of manipulating the broach.

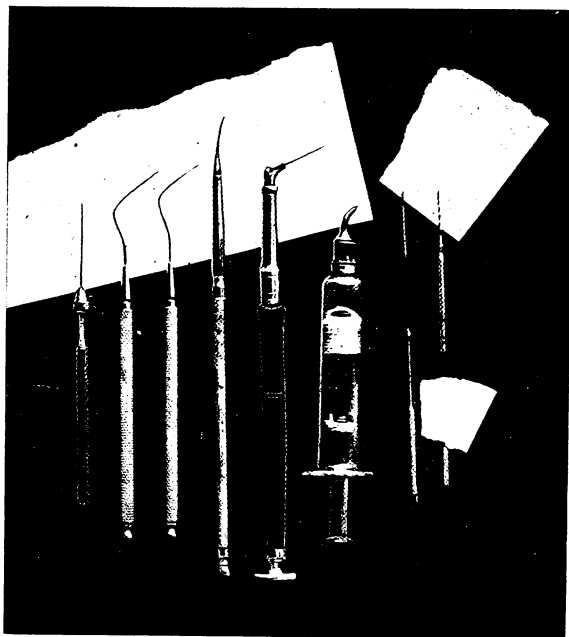


Fig. 8.

Fig. 8. Instruments used for the opening of root canals.

For very fine canals the barbs should be partially or wholly removed from the broach or a fine broach can be made from gauge twenty to twenty-five piano wire. These broaches should be cut to proper lengths and placed in a rigid holder or handle that will hold the broach in a direct line with the line of force. Either pressure or traction may be applied to the delicate steel point. For the heavier work, digging or enlarging should be done with larger and stronger points, made of roughened steel. A better and safer instrument may be made by taking the largest tantalum silicate plugger points, No. 104 or 5 S. S. W., bend to straight line, remove from the handle, file or grind to proper shape, and place in the strong right-angle broach holder made of ivory. This makes a most effective root canal excavator.

The metal is not acted upon or altered in any way by acids. This manner of enlarging or excavating the canal to a large extent at least eliminates the probability of making a false tract or pocket within the canal, and does away with the necessity of using a drill, at least, until the canal is large enough to make drilling a safe procedure.

The point that I am trying to develop is that I believe that the best results are to be obtained by eliminating the undesirable or dangerous, and taking advantage of the safer and desirable features and results, that may be obtained through the use or application of every chemical agent or instrument that will meet the exigencies of the case in hand.

In straight and sufficiently open canals or in canals that have been enlarged by chemical means to a sufficient size to pilot the root drill, for the sake of speed, for convenience in shaping of canal, a Kerr drill, or a Gates-Glidden, from which the point has been ground, or bud drill, may be used.

If the finer canals contain fairly well organized pulp tissue that the broach fails to engage, sodium-potassium should be applied. After the pulp or other organic tissue has been converted into a soapy substance, the removal of this soap from the canal becomes a necessity; some of it may be removed with a stream of water; only a small proportion, however. Swabbing with cotton on a broach does but little better. If the root canals of an extracted tooth be opened and thoroughly treated with sodium-potassium, the canals then washed out with water as would be done if the tooth were in the mouth, and if you then dry the tooth and crack open the roots, in the apical third of the root canal a dark, rather dense, soapy mass will be found packed within the fine canal. If the tooth fragments be kept dry for a day or so the dentin will show a greenish yellow color—not a very pronounced discoloration, but sufficient to show the presence of a coloring matter. All of this soapy mass will be thoroughly removed from the canal, if sulfuric acid be pumped into the canal in sufficient quantities to overcome the alkali, and having been worked to the end of the canal with broach, then the root canal be flooded with a saturated solution of soda bicarbonate. The reaction will at once remove practically all foreign substance from the canal. If the tooth then be dried and the roots cracked open the canals show white and clean as marble.

With the tantulum root excavator and sulfuric acid the root canal may be enlarged more rapidly and with greater freedom from unpleasant and sometimes dangerous conditions. The acid destroys and breaks down disorganized organic tissue, the soda solution removing the débris without forcing the disorganized substance through an open foramen, as many dentists seem to fear.

If acid solution be placed in a small glass tube, and you then pour the soda solution into the tube, it will be seen that chemical action is all on top of the acid, or only on the surface of acid exposed to the soda; or, in other words, it does not react in the form of an explosion, the larger end of the canal being open and offering no resistance to the gas. If the acid solution should pass through the foramen no further reaction could take place than that of irritation, as will be shown on the screen.

Rosin Solution in Root Canals.

By DR. J. R. CALLAHAN, Cincinnati, Ohio.

Read before the Kings County Dental Society, Brooklyn, March, 1915.

Colophony, resin, commonly known as rosin, is obtained from turpentine by distillation. In the process, the oil of turpentine comes over and the rosin remains behind. Rosin varies in color from dark red-brown to black and white, according to its purity, and the degree of heat used in its preparation. Chemically, it is the anhydrid of abietic acid. It has the physical and chemical properties common to all resins. It softens at 176 degrees F. and fuses completely at 275 degrees F., is insoluble in water; with difficulty is soluble in alcohol; freely soluble in chloroform, acetone, benzene, and fatty oils.

The rosin that is best adapted to dental uses that I have been able to find is that prepared by Bernardel for the use of the violinist. It is a French preparation, very near the color of dentin. The formula, as given below, makes a very thin solution. It required a long time for me to realize the advantage in the use of a thin solution. A thick mixture will not penetrate the tubules, nor does it give up enough chloroform to dissolve the gutta-percha:

℞	Rosin	gr. xli
	Chloroform	℥iij
℥	Fiat sol.	

Anatomy of Dentin.

As we are to deal with dentin that has been subjected to infection, a brief rehearsal of the histological anatomy of dentin will aid us in getting our mental eyes in the same focus.

Arthur Hopewell Smith, in his late book, "*An Introduction to Dental Anatomy and Physiology*," says:

"The functions of dentin are to give substance to the tooth itself; to provide a centre of sensation; to protect the pulp. Enamel is without

the pale of nutrition. The pulp is highly vitalized and the dentin is on the borderline of the living and the dead: semi-vitalized, if one may so speak.

"Nature would not for a moment tolerate the presence in the midst of living tissues of a dead body like enamel. The result is therefore the presence between the living pulp and the inert enamel, of a large area, relatively speaking, of a tissue which is marvelous and unique. In no

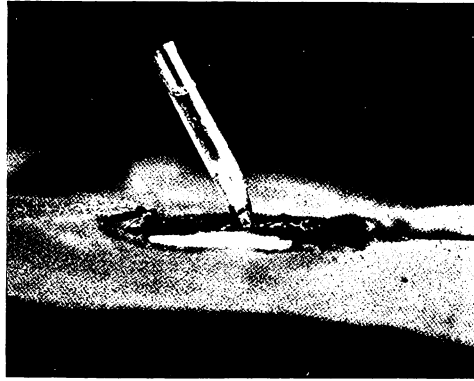


Fig. 1. Water dropped into a dry glass tube does not go to the end of the tube on account of entrapped air. Rosin solution should be worked to the ends of root canals with fine broach.

other part of the body do we find an entirely tubular structure like dentin. Its peripheral parts where it joins the inorganic enamel and cementum are less vitalized than its central parts. This explains the reason why the dentinal tubules are not of the same caliber throughout their lengths. They vary from 1.7 m. to 5 m. The diameter of the tube diminishes as it proceeds outward, until at the peripheral region of the tooth it becomes immeasurable. The dentin of the crown of teeth is more plentifully supplied with living material (protoplasm) than the roots; hence the tubes branch more frequently in the latter than in the former situation. The tubes carry the dentinal fibrils; that is, the peripheral poles of the odontoblasts."

It is through these dentinal fibrils that nervous stimuli are transmitted to the pulp. Following the teachings of Miller and Black in the study of carious dentin, we note among other interesting things that caries progress along the lines of the dentinal tubuli; that the form of the disintegrated dentin is that of a cone with the apex toward the pulp chamber, and that the dentin is decalcified in advance of the penetration of the micro-organisms.

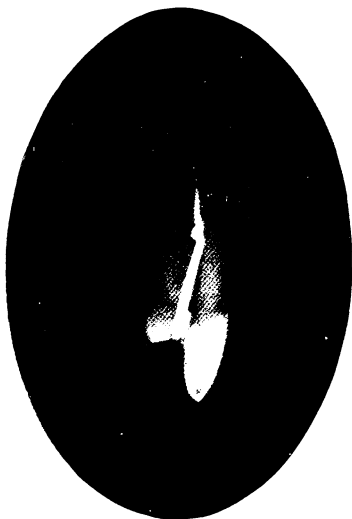


Fig. 2.

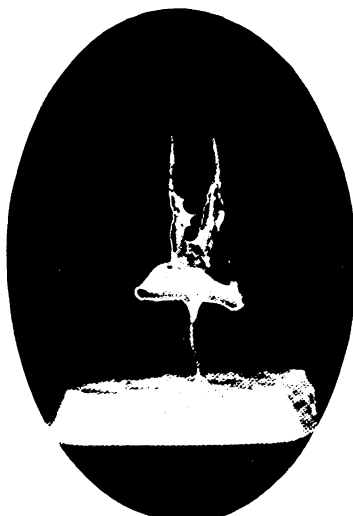


Fig. 3.

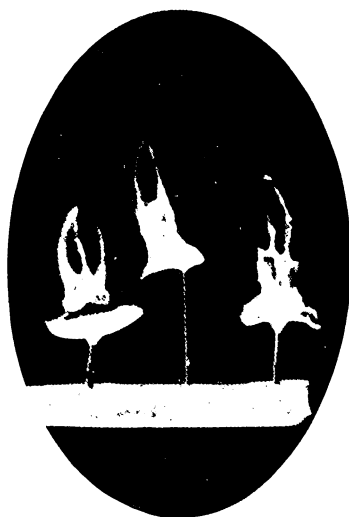


Fig. 4.



Fig. 5.

Fig. 2. Shows what happens when long gutta-percha canal point is forced into canal without the pumping motion.

Figs. 3 and 4. Tooth substance having been dissolved away from root canal filling. Shows the long minute canals that the rosin and gutta-percha solution enters and seals.

Fig. 5. Palatine root of upper molar enlarged with drill, making a false pocket. The rosin-gutta-percha solution not only filled the false pocket, but entered the true canal and filled it to the end.

It is not likely that in the preparation of cavities we always remove the apex of the affected dentin. In deep-seated cavities is this advisable? In spite of the application of strong antiseptic agents, recurrent decay may develop and toxins finally reach the pulp.

**Advantages
of Rosin.**

If the remaining traces of thin layers of decayed dentin can be thoroughly dehydrated, the application of rosin solution may be of great service.

First, rosin being more or less a non-conductor,



Fig. 6. The shaded area about the root canal filling shows the distance that the rosin has penetrated the dentinal tubuli in this tooth root.

it reduces the shock of thermal changes, thereby lessening the tendency to secondary growths or deposits within the pulp chamber that are so noticeable under large metallic fillings, especially under large gold inlays.

We are taught that the decalcified dentin that is to be found just in advance of the micro-organisms in carious dentin furnishes food for the invading germs. If the remaining decalcified dentin be saturated with rosin, I imagine the cost of living in that region will become prohibitive. However, if the rosin solution reaches the farthest boundaries of the decalcified dentin through the infected area, then the micro-organisms within the tubuli will have been engulfed within the rosin solution, and unless the bacteria are able to liquify the rosin, they will be forever inhibited from further activity, be they aerobic or anaerobic, in active or spore form. I need only mention the antiseptic properties of the chloroform.

This, you will admit, would be a very desirable condition in which to have a layer of decayed or decalcified dentin over the pulp, where the removal of the layer of decay would mean the exposure of the pulp.

The most satisfactory results that I have had in capping pulps has been to flow a rosin solution over the exposure, evaporating the chloroform with warm air, then to cause a very thin cement to flow over the floor of the cavity and the thin coat of rosin and allow it to harden, being very careful to avoid pressure of any kind on the cement until quite hard.

This practice has been confined to quite small and recent exposures. Not the least satisfactory use of the rosin solution is after more or less thorough drying of the cavity and application of the rosin prior to the insertion of gutta-percha filling, either as a temporary, or permanent filling.

On the removal of a temporary stopping of this nature, that has been in place a week or a month, the decayed dentin, which for any reason may have been left in the cavity, will be found noticeably tough and hard and dry, due to the presence of the rosin, and the sensibility of the dentin will be materially less, showing that the dentin has been free from the irritating effects of acids, or, in other words, the fibrils have been in a state of comparative rest. And after all is said, the chief function of the surgeon is to remove the irritant and place the affected region at rest, to the end that Nature may perform a cure.

Root Canal Filling.

We now come to the consideration of the time-worn subject of root-canal filling. Let us not undertake to discuss the treatment of root canals preparatory to filling further than to say that no root canal is properly prepared for filling unless a fine paper canal dryer, as furnished us by the dealers, can be passed to or near the apical foramen.

If possible, is it desirable or necessary that the tubuli be sealed?

Dr. Hermann Prinz, whom I regard as one of the foremost among our scientific research workers, said in a paper read before the St. Louis Dental Society, September 2, 1912: "If the canal is not filled perfectly, serum will seep into it from the apical tissues. The serum furnishes nutrient material for the micro-organisms present in the tubuli of a primarily infected root canal."

Multiple Foramina.

The dentin is traversed by dentinal tubuli, which number from 25,000 to 30,000 to the square millimeter. The pulp in situ sends protoplasmic processes into these tubuli, and is connected with the peripheral tissues by arteries, veins and nerves which pass through the main foramen and a number of small foramina (usually 2-7) present

in the apex of the tooth. According to Fischer, these accessory foramina are found in about ninety per cent. of all permanent teeth. These anatomic facts are not sufficiently emphasized at present. Their significance is of great importance for the full comprehension of the pathology of secondary infection.

In an incipiently infected root canal, these dentinal tubuli and the small foramina offer ready hiding places for various forms of pathogenic bacteria.

After exhausting the nutrient material, the bacteria become attenuated, or they assume resting forms. If the tubuli and the foramina are tightly sealed, these enclosed bacteria must necessarily remain permanently confined in their lodging places, while if the root canal filling leaks, the seepage of serum furnishes fresh material which offers excellent opportunity for their renewed activities.

**Action of
Bacteria.**

By continuity this secondary infection spreads along the lines of least resistance, *i. e.*, toward the apex, and finally reaches the pericementum. This tissue protects itself against the invading foe by a reactive inflammation, which results in the production of a fungus growth known as a granuloma, or in the past, as the abscess sack or pyogenic membrane.

For years the enclosed bacteria may remain dormant. At the slightest provocation, however, overexertion, a cold, increased blood pressure, lowered vitality, or some other cause, they may assume a most virulent activity, resulting in the production of the so-called subacute abscess. Based upon this supposition we are able to furnish a plausible explanation of how these obscure secondary abscesses occur about the devitalized teeth which at one time were pronounced cured.

In one of the most profound papers given to the dental profession on mouth infection, Dr. Rhein says: "Unfortunately, as a profession we must admit that most of the cases of blind abscess are the results of imperfect dental operations. In some cases they may be the result of bad judgment on part of the operator; in others they may be due to ignorance and incompetence, but a very large number of cases are attributable to the failure of the educated dentist to give the time needed to perform an aseptic operation and have the field absolutely free from the possibility of future infection. This is absolutely nothing short of malpractice when done by a dentist who knows."

We have the testimony of several investigators to the effect that it is possible to sterilize the root canal proper, but it is an impossibility to sterilize the infected dentin of a tooth while it remains in the mouth.

The microscope and the culture media have shown us conclusively that we have been, and are now, leaving enormous numbers of micro-

organisms within the body with a more or less available route open to the circulatory system where they may reach any part of the body, carrying destruction to those organs or parts that may offer the most attractive lodging place.

A most significant fact must be borne in mind in regard to the devitalized dentin. We have no blood current to assist in the struggle. The dentin has absolutely no power even to assist in repair. No granulation nor scar tissue—nothing but an inert tubular mass infected by millions of toxin-producing micro-organisms. We must make of this infected tubular mass an inert, harmless and stable body, including the effective closing of the numerous foramina, to the end that Nature may be able to develop the root mass in a healthy and vigorous peridental membrane that the tooth may serve its several useful purposes for a number of years.

**Requirements of
Root Canal
Filling.**

Most of us have at one time or another shared in the opinion that what the root canal might be filled with mattered but little.

The radiograph in the hands of the advanced dental practitioner has brought to light evidence sufficient to prove the fallacy of such an opinion. It does matter as to the material; it does matter as to the manner of placing the material in the canal. The matter of prime importance is the sealing of the more or less numerous foramina, and, as we have no assurance that all the foramina in a given root canal are located near the apex, it becomes our duty to seal the whole length of each canal with a material that will search out and seal minute canals or openings which, owing to physical conditions, we are unable to see.

**Gutta-Percha
Root Fillings.**

Have we a root canal filling material that will meet the requirements indicated above? We have three that may be considered. Gutta-percha and chloro-percha in combination; paraffin, as advocated by Dr. Hermann Prinz and Dr. Dunning, and the combination of rosin and gutta-percha. With the gutta-percha cone and chloro-percha you are quite familiar. We know of many successes as well as of many unhappy failures with this root filling, sometimes due to faulty manipulation, but often due to the fact that the root canal filling has shrunk sufficiently to admit body fluids to the canal, or permit egress of the micro-organisms that infested the tubuli, and in addition the gutta-percha root fillings are often found to be saturated with decomposed and odoriferous substances that we are altogether too familiar with.

**Paraffin
Root Fillings.**

The paraffin root canal filling, as advocated by Dr. Prinz and Dr. Dunning, has many attractive features, and time may prove it a most, if not the most, acceptable root filling. I have not always succeeded in getting the paraffin to the apex of the roots of upper teeth. If the wire is too hot the paraffin will collect about the shank of the instrument, and if not hot enough it does not flow to all parts of the canal. The melted paraffin will, however, follow the paraffin oil into the tubuli and foramina if treated properly. It will take time to prove its permanence within the body. Our previous experiences and the experiences of the surgeon have made us a little shy on this point.

**Rosin and
Gutta-Percha
Root Fillings.**

The technic of the rosin-gutta-percha root filling is simple, easy, quick, and sure to seal all tubuli and foramina *that are open*. Before proceeding with the filling of the root canal, all instruments, cotton-paper points, gutta-percha points, should be placed in the steam chest, superheated steam being the most effective sterilizing agent. After steaming the proper length of time, the steam is shut off from the chest. This soon dries the instruments and points and cotton broaches. The gutta-percha and paper points after cooling in the basket have lost none of their desirable properties.

I have said that a root canal should be of the general shape of the fine paper root canal driers as furnished us by the dealers. In addition to this general form, have the mouth of each canal a decided saucer shape. This will facilitate the placing of agents or instruments to or near the apical foramen.

**Drying
Canal.**

The first step, then, is the complete dehydration of the dentin, using acetone, as advised by Dr. Prinz, as the dehydrating agent. After flooding the canal with acetone, use the paper points liberally until the canal is entirely free of moisture. Follow this with warm air. Then hold a warm wire in the canal for a minute or two, being careful that the wire is not hot enough to scar any part of the canal.

Right here is where many root-canal operations fail. The canals and tubuli must be as dry as it is possible to make them, bearing in mind that it is possible to do damage by overheating the root.

**Introducing
Rosin.**

Now flood the dry root canal with the thin rosin solution, pumping it in with a wisp of cotton on a broach. When the canal is full of the solution, pass a fine wire or broach to the end of the canal. Work out all of the air that may be trapped therein. This is of vital importance.

After the canal has been flooded or pumped full of the rosin solution, dip the cotton and broach that is being used into or pick up on the cotton, bismuth oxide hydrate. Work this into the rosin that is already in the canal. This is not essential to the preservation of the filling, but makes a more distinct picture of the finer canal fillings when the X-ray is in use.

**Inserting
Gutta-Percha
Cone.**

The canal point should be made of base plate gutta-percha. It should carry no drugs nor any additional element that will have a tendency to weaken or reduce the strength or rigidity of the cone, because we wish the gutta-percha to dissolve rather slowly at the periphery, while the attenuated centre retains rigidity sufficiently to permit of being pushed along.

Select a gutta-percha cone that will reach to or near the end of the canal, holding the cone with a fine foil carrier, and pass the cone carefully and surely about *half-way* into the canal, pumping the cone up and down in the canal, usually from forty to sixty times, and, as it dissolves in the chloroform, advancing the cone farther toward the apex.

The pumping motion forces the rosin solution farther into every opening. The chloroform at the same time dissolves the periphery of the gutta-percha cone, which, becoming more and more attenuated, slips farther toward the apex, surrounding itself with a mixture of gutta-percha and rosin. The rosin seals the tubuli and at the same time causes the gutta-percha to stick tight to the canal walls and makes the gutta-percha more stable and proof against the action of body fluids or substances.

If this does not leave the large end of the gutta-percha cone at or near the end of the canal, place a small cone alongside or on the first one, then, with cold steel plugger points that will go into the canals, gently pack the mass into the canal, using warm air to soften the protruding gutta-percha if necessary.

This packing forces the semi-fluid (chloro-percha and rosin) into the unknown canals and pockets, and at the same time brings the surplus chloro-percha to the mouth of the canal, where it may be taken up with absorbent rolls or cotton.

In multi-rooted teeth complete the filling of each individual canal before starting another.

Rub the steel plugger points on paraffin cake to prevent the partially dissolved gutta-percha from adhering to the instrument. The pulp chamber is to be filled with one of the cements.



**Queries
Answered.**

You may ask: "Do you succeed in filling all canals and tubuli to the farthest extremity?" No; only those that are open and dry to the farthest extremity.

Are we likely to have inflammation in the periapical region following the closure of root canals in this manner?

The probability of inflammatory conditions in all cases depends upon the ability of the operator to read the pathological signs of each individual case and his skill and delicacy of touch in the manipulation of the various agents used.

Rosin and chloro-percha and gutta-percha cone is superior to chloro-percha in three ways. First, the rosin in chloroform penetrates deeply into the tubuli and foramina, into which *chloro-percha will not enter at all*, leaving within such tubuli or foramina, upon the disappearance of the chloroform, a more or less solid, inert, insoluble substance that enmeshes the contents and seals the lumen of such tubuli or foramina. Second, the rosin and chloroform causes the gutta-percha, in whatever form it may be applied, to adhere closely to the walls of root canal or cavity. Third, the incorporation of the rosin in the freshly made chloro-percha makes an unshrinkable and impervious mass about the gutta-percha cone. If gutta-percha and rosin be dissolved in chloroform and left in an open dish or tube to dry or solidify, the rosin will rise to the surface and harden in a crust over the gutta-percha. When the mixture is made in the root canal, as has been suggested, the rosin in solution is held firmly in place in the dissolved gutta-percha between the canal wall and the cone in the centre.

We must be prepared to meet all sorts of morbid anatomical changes in the pulp chambers, root canals and the dentinal tubuli, due largely to constructive irritations long present in and about the tooth.

The slides that I shall show on the screens are selected, each one, to assist in demonstrating that the teeth which require root canal treatment are, as a rule, far from being the perfect anatomical specimens that we see illustrated in our text-books. A tooth that has lost its pulp has usually been subjected for a long time to those conditions that bring about destructive as well as constructive changes.

The rosin solution does not show in X-ray pictures until mixed with gutta-percha, when it shows very plainly in the canals and foramina, but not in the tubuli. Chloro-percha will not enter the tubules; bismuth oxide does not dissolve in chloroform, and therefore does not enter the tubuli; the blue stain spoken of enters the tubuli with the chloroform and rosin solution, but does not show in X-ray pictures; so, in order that we might have some visible evidence of the diffusibility of the rosin solution

through the dentin, I have resorted to color photography. To vouch for the correctness of the pictures I have the original specimens here for comparison. One better versed than I in laboratory technic could certainly work out a more satisfactory scheme than this.

The pulp canals of a number of extracted teeth were opened mechanically—that is, with burs and drills—dehydrated and pumped full of the rosin and chloroform that had been stained blue. Then the gutta-percha cones were used as has been described above.

I do not claim that this procedure gives an exact reproduction of conditions in a tooth canal while the tooth is yet in service in the mouth. I do claim that the specimens and the pictures give a clear and understandable basis from which we can work toward a reasonable ideal.

These slides are shown more to explain the theory than to prove results. There is a vast difference between filling a root canal in an extracted tooth and one in situ.





Wisdom Teeth.

By JOHN D. THOMAS, D.D.S., Philadelphia, Pa.

I have, from time to time, in the goodly number of years of my experience as an extracting specialist, or as an oxodontist, as our friend, Dr. Winter, of St. Louis, is pleased to make the term, written several articles bearing upon this subject, which have been read before numerous societies, and I find in looking over the archives that in 1886 I wrote a paper for the *Dental Practitioner* and read it before the Odontological Society of Philadelphia in January of that year, in which the conditions and difficulties were described, and I can find little to add except to change and modify the conclusions and recommendations of that day.

Early Extractions for Regulating Teeth.

The conditions of suffering from the diversion and perversion of these teeth in their efforts to erupt are the same to-day, only more so. In those days it was the practice to extract, for "regulation," one of the bicuspid on each side, and in some instances it was recommended that the temporary molars should be extracted, so as to enter the process and remove the bicuspid which were not as yet wholly formed to forestall the possibility of irregularity. It was also what might be termed a craze with some of the profession to leave the bicuspid and extract all four of the first permanent molars, sound or unsound, and in many cases if operated upon at the tenth or eleventh year the other teeth would come together and the mouth be beautifully regulated by its own growth and adaptability. But sometimes it would not. It was, however, a notable fact that where these teeth had been extracted it was of rare occurrence that there was any difficulty in the eruption of the wisdom tooth. From that experience I asked the members of the Odontological Society to help impress upon the profession the necessity of giving such consideration to these oral perverts as would relieve our patients of much of the suffering they had to bear.

Since then the whole practice of dentistry has changed. Instead of extracting to correct irregularities, our friends, the orthodontists, have by scientific methods and appliances succeeded in a measure in expanding the jaws to make room for the full complement of teeth, or, rather, the ten front teeth in either jaw. Their efforts seem to cease at the first molar, and there is no thought whatever of the late but persistent incoming of the wisdom tooth. As a result, the extracting specialist, or exodontist, has more third molars to extract as an individual tooth than any other in the mouth. As a record, the writer had in one morning seventeen such operations in succession. This would seem to indicate that, in our present status, these teeth are superfluous.

Originally, of course, an all-wise Providence intended the jaws of the whole animal kingdom to become sufficiently developed to give ample room for all the teeth designated as necessary for the proper mastication of the food required for the sustenance of each, and I am not cognizant of any instance in the lower animals where contraction of the jaws has been such, that teeth in their natural eruption have given trouble from lack of room in their development. But this occurs with the human species, whether from amalgamation of the races (speaking of our own people) or the too strenuous efforts of education and refinement to produce a class of thoroughbreds and promulgate the very best that can be produced in human life, or whether it is a sign of degeneration is a subject not under discussion here; but the fact remains that a vast number of the clientele of the dental profession exhibit this condition of lack of room in the human jaw for the full development and eruption in their proper places of all the teeth originally intended, and the wisdom tooth is "the goat," and a mighty vicious goat he is in many instances.

It is not the intention in the present paper to discuss the causes of the malposed, diverted and perverted conditions which these teeth exhibit, but to speak of them as they exist and to tell how to handle them, and I wish to be understood as discussing the lower jaw. Wisdom teeth in the upper jaw give comparatively little trouble in extracting, though in a few instances I have met just as much severity in the operation as in the lower, but the greater elasticity of the bone composing the tuberosity render them easier of manipulation, and consequently there is less injury from trauma. It is the condition of the lower third molar that I am referring to here.

**Removal of
Lower Wisdom
Teeth.**

There was a time in my career when if the extraction of one of these teeth was considered essential, it was expected by the dentist that it should be done, and it generally was done; but, oh Lord! what havoc was perpetrated! What suffering engendered!

Their position at the angle of the jaw is where the surrounding soft tissues are most susceptible to the influences of inflammation, and as no one can be sure of controlling this inflammation, or the extent to which it may go, it would sometimes involve tissues and glands in the throat and neck, as also the cheek. In addition to this, the amount of physical force necessarily applied would cause inflammation of the bone, and being in close proximity to the inferior dental nerve, all combined made the post-operative pain more than any patient should be called upon to bear.

To the mind of the ordinary citizen in any community, the extraction of a tooth is considered but a small operation, painful, of course, for the moment, but he expects relief from toothache at once, and that is to end the incident; but to have to endure such a post-operative ordeal as was here witnessed was unlooked for, and to their minds uncalled for. In many instances it was necessary to visit patients at their homes, for after treatment, or they would call in their family physician. As the extraction was blamed for it all, they would expect the dentist to pay the physician's fee, and probably to pay the patient for loss of time from his occupation, and four or five times in my life I have been threatened with suits at law for damages. Under these circumstances it became necessary to modify somewhat the line of procedure. I have grown to be merciful and give the patient first consideration. Any operation which is bound from trauma to cause more suffering than relief, the consequences of which are so serious, in many cases should be avoided until we can see whether delay will not develop more favorable opportunities for final results.

Classification of Crowded Wisdom Teeth.

I classify these oral perverts under four heads. They vary, of course, in degree, and each variation if described in full detail could furnish material for a separate article. But I think for the purposes of this paper each class will be readily recognized by the description here given. But I wish to impress on the reader as forcibly as I can that the cause of ninety-nine per cent. of all the cases which are responsible for all this trouble is lack of space.

Class 1.

Those which in their development and eruptive effort from lack of room are forced out of alignment Their crowns may point, following the line of least resistance, either directly toward the tongue or reversely toward the cheek. During their progress, inflammation of the soft surrounding tissues will ensue; this may be relieved by free lancing and blood letting. As the tooth is free from stricture in its accepted direction, it is only a "waiting



policy" to delay until the crown has progressed sufficiently to secure a good hold by the forceps. Their roots are seldom crooked or divergent, and extraction is not a difficult operation. It may be that lancing may have to be repeated before they arrive at the extracting stage, but they exhibit nothing serious either in the operation or aftermath.

Class 2.

These cause greater difficulty. They will come forth in perfect alignment with the anterior teeth, but for want of space will be pushed so far in the rear that they become locked in by the second molar and the ramus. Sometimes quite half or more of the cusps will be under the bone, and further progress in eruption is impossible. Here is where we get the crooked and diverted roots which make these teeth anomalies and so difficult to extract. From the earliest formation of the tooth the crown is caught as above described, and in the development of the roots from the crown to apex the roots must follow the line of least resistance in the cellular structure of the bone. Their extraction is most difficult, and the post-operative effects are also most severe. I have in a few instances cut away the bone with a surgical bur to give room for their removal, but from the malformation of the roots in most cases the operation has not been satisfactory. We must bear in mind that they are buried in solid bone and hard bone, too. There is the second molar in front, broad, solid bone on the buccal side and the ramus behind, and the place of least resistance is usually the lingual side, toward which the force must be applied. If the roots should be straight or combined and curved the injury will not be so great, but they are seldom so. In directing force toward the tongue we run the risk of breaking a bit of the bone of the inner plate; we also run the risk of injury by friction to the second molar, so that its loss may be looked for in the not very far distant future. So in view of all that I have witnessed in the pain caused by the persistent effort of the tooth to erupt in its proper position; the suffering subsequent to the operation; the risks we run from the close proximity of the tooth to the inferior dental nerve, which by reflex may involve all the nerves of the eye, ear, nose and throat; and recognizing that the condition is brought about from lack of room, as the easiest way out for all concerned I recommend the removal of the second molar, allowing the wisdom to take care of itself.

Class 3.

These are the slanting ones, and are trying to the soul of the exodontist as well as to the feelings of the patient. The difficulties of their extraction increase with the variations of their position. They do not excite as much inflammation of the soft tissues in the preliminaries of the eruptive

efforts, as some others, but if they do, free blood letting will afford relief until their position is permanently secured. Their roots are mostly straight or combined and curved, and if the crown is not too low down, by directing the force toward the lingual plate the bone will distend. So by turning it in its socket from under the crown of the second molar it may be removed without any great strain or injury to the roots. But the anterior cusps are often found pressing against the posterior root of the second molar anywhere from below the enamel of the second molar to half-way down to the apex, so that their removal in many cases is next to impossible and in some cases absolutely so, without taking the second molar also. In such condition, instead of taking both, it is better to remove the second molar and leave the wisdom tooth; even in its slanting position it is better than no tooth at all, and we have relieved the pain by supplying room. All this applies, of course, to cases where both the wisdom and second molar are perfectly sound.

Not always from carelessness on the part of the patient, but from absolute inability to preserve perfect cleanliness at the point of juncture between the crown of the wisdom tooth and the posterior portion of the second molar, we may find a cavity at that point in the second molar, unsuspected by either the patient or dentist, until it has penetrated the pulp canal of the second molar. To my mind, it would be utterly futile to devitalize the pulp through the crown or otherwise attempt to fill such a cavity; hence the extraction of the second molar becomes imperative in these cases.

In the cases where these slanting teeth present with decay and pulp exposure we have added troubles. The second molar is sound, and it is not only desirable, but very essential, that it should be preserved. Although the removal of the second molar renders any case of slanting third molar an easy and simple extraction, where to conserve and retain the second molar is an object most to be desired, it is my practice to crush the crown of the third molar and to remove the portion pressing against the second molar. Then if the undecayed portion of the tooth is above the bone sufficiently to get hold without too much effort, the balance can be removed. But we frequently find the cavity below the edge of the bone, in which case I crush and remove as much as possible, remove the pulp, and leave the balance for a future operation. It may be six months, or a year, or longer, but the root is bound to rise to the surface, and at a future time its extraction will be an easy matter. In order to accomplish this and to make the crushing of the crown less difficult, I have with a bur or drill sometimes made several punctures in the crown.

Unquestionably it would be appreciated by the patient to know the



tooth was extracted completely at the first operation, but will he patiently endure the post-operative suffering incurred? It is not so much the question of getting the whole tooth out as it is of the patient submitting to the consequences.

These are peculiar. They form in the body of the bone, never come to the surface, and from any indication exhibited in the mouth will give no evidence of their presence; but they are there. In extracting the second molar from any cause, I will not say I have met a dozen, or a score, but hundreds of them, and I have no doubt if the X-ray could be applied in all cases we could find thousands of them. Having made their position in the bone and become fully developed they lie there quiet and serene, and compared with their great number a very small percentage of them are the cause of trouble and their existence may never become known. When they do make their presence felt, they assist themselves nobly, and this is exhibited by intense neuralgia of all branches of the fifth nerves and by reflexes which will involve at times all the nerves of the eye, ear, nose and throat. There are just two ways by which this great suffering is brought about. One, by the contact of the wisdom tooth crown against the posterior root of the second molar. Resorption of the dentin in the second molar will occur until it penetrates to the pulp canal of that tooth. Second, the reverse action. By the same process the roots press against or even penetrate the roof of the inferior dental canal and impinge upon the dental nerve. Neuralgia and all its concomitants will be the result. These cases are sometimes difficult of diagnosis, but by the radiograph they are readily discovered. Of course, removal of the second molar is the first proposition in either case, and in ninety-nine cases out of a hundred relief is complete. The others do not come within the realm of the extracting specialist, but are legitimate subjects for a major operation by the oral surgeon.

I think I have said enough to demonstrate that the varying degrees of perversion in the growth and eruption of these teeth is due to lack of space in the jaw. I have been criticized in a few instances for recommending the extraction of the second molar, but when we recognize the post-operative suffering and the injury to the bone and possibly to the inferior dental nerve, which may result, the risk is too great; so all things considered my many years of experience convince me that I am right.

**Orthodontists
Responsible for
Impacted Teeth.**

The number of these impacted teeth, particularly those described in Class 2, has mostly increased in the last few years, and I cannot avoid the feeling that orthodontia is in a measure responsible for a good deal of the difficulty. The orthodontist has

demonstrated the possibility of expanding the jaw to the extent of placing the ten front in their proper position, but their efforts, as remarked before, cease at the point of the first molar, and they have given no consideration of what is to come after that. It is an established fact that where a tooth, any tooth, has been extracted, the incoming wisdom tooth has a far easier time on that side.

**First
Molars.**

Now, just a word about the first molars. It is a well-know fact that from systemic cause these teeth are erupted with defective structure, and caries soon appear. In very many of them, filling will not effectually arrest the decay and the process is familiar to us all. Increased decay, which we treat by amalgam or cements, in the hope that the tooth as the child grows older will improve in density of structure. "But if pulp exposure appears," Dr. Darby says, "before the eleventh year, it is better to extract." I go further than that and assert that any first molar, the pulp of which must be devitalized before the fourteenth year, should better be extracted, because it cannot be treated with any degree of certainty of permanency. It is more than likely to progress in its disintegration, requiring a large amalgam filling and then a gold cap, and final extraction, at some time after full maturity of the patient. In the meantime the wisdom tooth has had its fling with all its triumphs in causing trouble, and this tooth is most likely to be a perfect and beautiful one, which in its rightful position would have been a useful member for life. Yet it is sacrificed because of the retention of a defective first molar, and when the final extraction of the first molar does occur, the second molar is left like the last rose of summer, all by itself, and the posterior part of the mouth is practically ruined for masticating purposes. If the first molar had been extracted at ten, twelve, or even fourteen years of age, space would have been given for the proper eruption and alignment of the wisdom tooth. Heaven forbid that we should go back to the days of '86 and extract all first molars, sound or unsound; but I wish the profession would give greater consideration to the conditions caused by these oncoming teeth.

It is the practice of the medical profession to do all they can for the prevention of disease rather than to rely solely on treatment after the disease arrives. Inasmuch as the jaw in many cases does not afford room for the proper placement of all the teeth provided by Nature, it is the province and duty of the dental profession to see that space shall be provided and thereby spare our clientele from the great amount of suffering that is exhibited to-day.

Undoubtedly there are many of these cases which could perhaps be brought in the field of the regular surgeon as major operations under

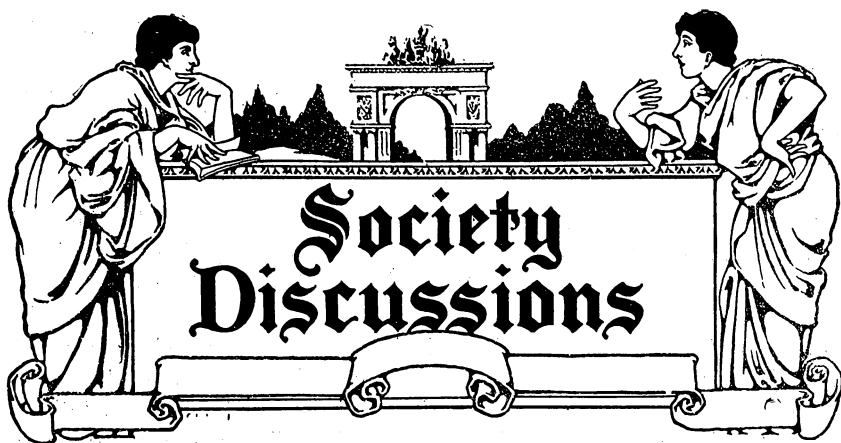


ether, with corresponding fees, but in all my experience—and it may be admitted in a record of over 292,000 operations that I have met a few of them—I can recall but four cases where the major operation was recommended by me. Three of these were of the type referred to under Class 4. The fourth was of Class 2.

The first two of Class 4 resulted satisfactorily, but the third case destroyed the roof of the dental canal, and in the process of healing and such reforming of the bone as was possible the solidification of the bone impinged upon the nerve to such an extent that a severe case of tic douloureux resulted. There was first trephining of the bone back of the foramen and a resection of half an inch of the nerve, which gave relief for a time, but as a finality the gasserian ganglion was removed.

The fourth case was of Class 2, in which repeated attacks of inflammation had brought on indications of necrosis. The man was fifty years of age with a perfect row of teeth up to this point, and the extraction of the second molar would have proved of no avail.





Second District Dental Society. March Meeting.

A regular meeting of the Second District Dental Society of the State of New York was held on Monday evening, March 8, 1915, at the Kings County Medical Library, No. 1313 Bedford Avenue, Brooklyn, N. Y.

The President, Dr. Stevenson, occupied the chair, and called the meeting to order.

The Secretary read the minutes of the last meeting, which were approved.

Dr. J. R. Callahan, of Cincinnati, read the paper of the evening, entitled "Root Canal Preparation." The paper was illustrated by lantern slides.

Discussion on Dr. Callahan's Paper.

**Dr. Herman Prinz,
Philadelphia.**

We all know that the work Dr. Callahan has shown is not something new, or something that he is trying to force upon us as some recent discovery, but something he tried twenty odd years ago, and which in the meantime has stood the test of time. It is a very good method, and one which, though perhaps not in all cases, has aided very materially indeed in the cleansing of root canals. If I were to discuss all the phases he has touched upon, the night would not be long enough, so I shall limit myself to the chemical side, perhaps because it is more familiar to me.

Tantalum.

Let me say a few words in regard to tantalum. It is a new metal which has been recently introduced and which has proved a most excellent substitute for platinum. It melts at 5,000°, and a number of dental instruments, among them various types of broaches, are made from it; also appliances

for regulating the teeth, as it stands very well in the mouth, and is destined to take an important part in dental instrumentation.

**Potassium
and Sodium.**

The Doctor has referred to the potassium and sodium alkali. Potassium and sodium alkali in the sense it is employed in this particular procedure, does not exist. It is an alloy, and is the same kind of alloy as you use in your office for filling teeth. The two metals form a specific alloy, and when this alloy comes in contact with the material in pulp canals, immediate decomposition takes place, and the results as you have seen will occur.

The potassium and sodium metals commercially are preserved in coal oil, and when we place a small quantity in contact with water, at once a process of hydration occurs, and caustics are formed that will produce a powerful action, destroying organic tissue and to some extent inorganic tissue.

It is in reality a reverse of the process where we decalcify a tooth, leaving the matrix in position. Here we remove the organic matrix, and as a consequence the bony part or the lime salts fall apart, being either washed away or destroyed.

Caustics.

The Doctor has gone into a discussion of caustics. He has referred to the various acids and also to the action of arsenic, speaking at various times of the "caustic" effect of arsenic. In the real sense of the word, arsenic does not belong under that heading. It is what we call a protoplasm poison, but it does not destroy protoplasm as a caustic does.

If we take five drops of sulfuric acid and place it upon organized tissue, or take it in the mouth, the result will be that this caustic destroys the tissue. When we take these five drops of sulfuric acid and place them in a glass of water and drink it, there will be no reaction. We simply have a pleasant acid drink and will be happy and contented with it. With a protoplasm poison, the results are different. Take arsenic as an example, because it is familiar to us. Whether you take it as five grains of arsenic plain, or you take it in the glass of water, you will die either way.

Another important factor is this: arsenic will never act upon dead tissue. A protoplasm poison never does. Take a piece of flesh and put on it a quantity of arsenious acid and it will remain forever. That is why taxidermists use it for preserving the skin of animals, but if it is placed on living tissue it will kill the tissue.

Use sodium hydrate or potassium hydrate instead, and that piece of flesh or bone will be destroyed if the employed material is sufficiently

strong. There is no difference between living tissue and dead tissue where the action of a caustic is concerned.

**Root Canal
Treatment Using
Acids.**

Let me say a few words upon the various phases of root canal treatment by means of the acids. The Doctor has referred primarily to sulfuric acid, and the dental profession as a whole is deeply indebted to Dr. Callahan for introducing this to the profession, because it is a distinct epoch-making step.

Many years after Dr. Callahan had introduced this method of opening root canals, some one suggested that instead of using the 50 per cent. sulfuric acid—equal parts of acid and water mixed—it would be preferable to use a mixture of liquid carbolic acid and sulfuric acid, thereby creating the so-called phenol-sulfuric acid, and kill two birds with one stone. On one hand was the phenol and on the other the sulfuric acid. Phenol is a very powerful antiseptic and serviceable for root canal treatment, and the sulfuric acid would be very good; and each one being good, why should not the two together be better?

But when the two are mixed, chemical combination takes place, whereby the phenol is completely destroyed and the action of the sulfuric acid is materially reduced; and so phenol-sulfuric acid has no value for this purpose.

Using sulfuric acid, the Doctor has suggested 50 per cent., which is correct for very commendable reasons. If we use a pure sulfuric acid, about 90 per cent., we will have at first no action whatever. If we use pure sulfuric acid and pour it into our hand for a short time and wash it off, aside from a slight sensation there will be no action. Why? Because the acid is so concentrated that its molecules are not free to move and it has no time to exert its effect. If, on the other hand, you separate the molecules with water, we give them a chance to act at once; and if we take 50 per cent. sulfuric acid we have a pronounced effect in a short time. If we would use the pure acid it would take too long to produce the action, and when the action is produced it is entirely too powerful. Therefore, 50 per cent. solution is of more benefit.

He has explained to you the effect on living bone and on dead bone. One peculiar and valuable effect of sulfuric acid which he has mentioned, but which I think he should emphasize, is the self-limiting action.

Hydrochloric acid has also been advocated as a substitute for sulfuric acid. Since hydrochloric acid forms more or less soluble salts with the calcium salts of the tooth, its action is much more pronounced than sulfuric acid, which forms the insoluble "plaster of Paris" with some of the calcium salts, and therewith checks its own action.

**Hydrochloric Acid
in Canals.**

A distinctly more effective way for opening root canals is obtained by using nitro-hydrochloric acid, commonly known as aqua regia. It has been introduced for such purposes and has been highly recommended by Boenneken. This acid, a mixture of approximately one part of nitric acid with four parts of hydrochloric acid, produces nitrosyl chloride, a most powerful germicidal agent, which is highly destructive to organic acid. When neutralized with sodium dioxide, hydrogen dioxide and, later, free chlorine gas is produced. Nitro-hydrochloric acid is most destructive to almost all metals. Tantalum metal and steel are not affected by it to any extent. The steel broach, when brought in contact with this acid in concentrated form, is immediately covered by a protecting layer of oxide, which prevents the further action of the acid on the broach. Only minute quantities of this acid are necessary for the purpose in view; its action is very rapid and highly effective, and it deserves to be recommended.

Dr. Callahan has introduced the acid method; he has introduced an epoch-making step in the progress of dentistry, which is worthy of our highest consideration; and when the time shall come when we shall have a Valhalla where we place the names of our great men in dentistry, I think Dr. Callahan is entitled to a place therein.

Dr. Frazer.

In the notice of the meeting of one of our Brooklyn societies, you may read that Dr. Callahan's name is known wherever dentistry is practised—a very pretty compliment paid to Dr. Callahan; but I want to add to the quality of that and say Dr. Callahan's name is known wherever good dentistry is practised. It was not many years ago when it was exceptional that a dentist could tell you without stammering what method he employed in his root canal work. He could not tell you because he did not know. He treated one tooth in one way and another in another way. Dr. Callahan has given us a method which we have had for many years, and it has proven its worth, and I have a feeling that Dr. Callahan's name and Dr. Buckley's name should be connected. Dr. Callahan has given us a method of root canal preparation, and Dr. Buckley has given us something to put into those canals under certain conditions.

Chas X-Ray.

Dr. Callahan has spoken of the radiograph. We know its value; but, after all, the radiograph tells us only what we may have or may not have done. The radiograph does not show us how to get to this "strategic point," as Dr. Callahan calls it. It is of great help to us, and it would be nice if all of us could have in our offices a radiographic outfit; but I have a feeling that the Roentgen ray is a pretty powerful thing, and unless we can give some of our time to the study of its use, most of us would better leave it alone.

**Asepsis in
Root Canals.**

We all quite agree with Dr. Callahan that the first thing to be established in our treatment of root canals is asepsis, and to establish and maintain that we must use the rubber dam. In conjunction with the use of the rubber dam, I want to speak of the use of Dr. Callahan's copper band. I do not know how many of you have used it, but let me tell you, you cannot do without it—a copper or German silver band. Perhaps you did not get quite the idea Dr. Callahan wished you to get. Imagine a lower sixth-year molar with a cavity on its mesial surface, dipping down to or below the gum. Put on the rubber dam, and it bridges the space between that and the second molar and you have leakage. That is where the copper band is fine. You fit it as Dr. Callahan has described, trimming to the gum line, letting the portion mesial to the molar dip down below the cavity proper, and you have converted your complex cavity into a simple one, and you can use your rubber dam and work in an aseptic field.

Sterile instruments are, of course, necessary. I suppose the cabinets in your offices are clean. I dare say no one will claim his cabinet to be sterile—but it is clean. Burnishers and excavators and such instruments do not have to surgically clean, and our cabinets are good enough places for them, but they are not the place for your root canal instruments. Those, I think, should be cared for in some other place than in your instrument cabinet. They should be put into sterile receptacles and placed, if you like, in your formaldehyde cabinet. I have been doing that for some time. Dr. Ottolengui does better. He places his instruments and his gutta percha points in small glass dishes, in the bottom of which are pads soaked with formaldehyde, and those dishes in turn are placed in his formaldehyde cabinet; so he feels when he picks up an instrument for canal work, or his gutta percha points, that he is using something that is perfectly sterile.

Instrumentation in the successful treatment of pyorrhea is undoubtedly the all-important factor, and I believe instrumentation in root canal work is the all-important factor. We have been inclined to be too hurried, I think, in that. When we make an appointment for the opening of a tooth—the pulp chamber and root canals—we should see to it that there are not going to be three or four other patients calling at that time. We must not be hurried, and we must know that it is only by being careful and patient, as Dr. Callahan says, that we are going to work down to or near that end. There may be one or two men in New York or Brooklyn who go to the ends of all roots, but I think the average dentist cannot do it until the Almighty changes His plans on which teeth are made.

Dr. M. E. Rhein,
New York.

It has been very enjoyable to listen to the humor that Dr. Callahan has put into this very sombre discussion. In a way, it reminds me of a dance in the death chamber at Ossining before one of the inmates is going to be electrocuted the next morning. But it is pleasant to be able to handle this subject in that way.

Professor Prinz forestalled me in a great deal I wanted to say about the combination that kalium natrium (sodium and potassium) forms, and that it is an alloy. It will be twenty years, I think, this summer since I first saw Dr. Emil Schreier, of Vienna, use this alloy of these two metals. I believe that this method of his, notwithstanding all we have listened to from both Professor Prinz and Professor Callahan, the best and simplest method of not only reaching the end of the root, but of being able to pass through the end of the root.

I would like to go a step farther than Professor Prinz went when he spoke of the action that takes place when sodium and potassium comes in contact with water. It is the intense affinity which this alloy has for water that produces the valuable results we obtain. The affinity which sodium and potassium has for water I have frequently compared to the affinity which the magnet has for a piece of iron. It is so great it will jump an appreciable gap to make this "marriage," as it were, and when it occurs, it occurs with such an intensity that in the majority of cases I do not agree with the clinical results that have been described. I have watched this action closely hundreds of times, and seen this action result in an entire obliteration of both the sodium and potassium, and of a given quantity of the tissue which has this water in it. I will admit that under certain conditions we sometimes get a certain amount of saponifying of the tissue, but on many occasions I have seen a complete absence of this saponified tissue, due to the great intensity of this inter-marriage between this alloy and this substance that has a given quantity of water.

I cannot tell you this as Professor Prinz would—I am not a chemist—but I believe that it is due to the different proportions of water that happen to be present in the tissue that it is acting upon. Its action is most favorable when we can get this entire obliteration of everything—absolutely nothing left.

I have devoted a great deal of energy to the technique of the use of kalium natrium, and like everything else, unless it is used intelligently, it can be the instrument of evil instead of benefit. It is, in the first place, of the greatest importance that it should be used in very small quantities. The quantity should never be large, and that is one of its greatest objections, because it makes the progress toward the end of the root

canal slow; but it is the only safe method of procedure.

**Curved
Root Canals.**

I know nothing about negotiating curves of root canals mentioned by the essayist. I do not believe an appreciable curve can be negotiated with any amount of safety, and I do not think it ought to be

attempted.

The last speaker made a remark that the radiograph does not tell us how to do it; but that is exactly what the radiograph does do. I never said that we could reach the end of every root. I have said that where the pulp has been dead, and there has been an infection, and we cannot reach the end of the root, and we cannot go through it, then that tooth must be extracted; but I do say that the percentage of cases in which we cannot reach the end of the root depends upon the means at our command and the ability of the individual to utilize and profit by those means.

The essayist and I agree, and a great many of my friends agree, that the thing to accomplish is to seal the periapical end of the root if we want to leave that tooth in such a condition that re-infection is impossible. In order to accomplish that, it is necessary that we should get a straight line from the point of entrance in that canal to the end of that root, or as nearly as possible a straight line.

**Dr. Henry Gillett,
New York.**

Dr. Callahan sets his results before us so clearly and in such a manner that even if we do not quite agree, we never feel like saying so; but I must say I seldom disagree with him in connection with

matters concerning root canal work.

**Value of X-Ray
Machine in the
Dental Office.**

I do have a little different attitude concerning the value of radiography in our work. I have reached the point where, if my X-ray apparatus were taken away from me, and I could not have it in my own office at my command to use immediately when-

ever I wanted it, I should give up the practice of dentistry. There is, in my estimation, no branch of the healing art in which the possession of an X-ray outfit in the office of the practitioner, under conditions where he may use it at will during the progress of his work, is of as great importance as in the practice of dentistry.

It is not sufficient that it be around the corner, or even in some other office in the same building, to get the same service. I take exception to the point that is repeatedly made at our meetings that it is unduly expensive. It is not, for the results it provides either for the operator or his patient. In fact, it returns such great value to both that I believe no operator who assumes or claims and sets forth to his patient that he is

doing dentistry of a high grade can possibly get along without it. It is an essential part of high-class dental practice to-day.

There is an idea that because the specialist in that work charges \$5, or \$10, or \$15 for each exposure, that the expense is prohibitive. One of our practitioners in New York, who makes an exceedingly great use of it, to be sure, so that his percentages come down somewhat, compared to what would be the case in many other offices, has made a careful estimate of it, including the depreciation of the machine, and he has figured that radiographs in his office cost him 12 cents apiece, including the time he puts on it. Many a radiograph is worth \$50 to the patient. He saves three or four hours of time with the operator prodding and hunting and wondering where he is going to come out, and that sort of dentistry in the end is a loss to the patient.

**Better Canal
Instruments
Needed.**

One of the essential needs at the present moment in this department of our practice is the development of better instruments for the work. With the assistance of radiography and the careful study we have made, more especially in the last two or three years, we have advanced to a stage where our desires are in advance of the possibilities of instrumentation. Our instruments are not up to the man. I hope we may stimulate a broad interest on the part of the manufacturers, either in the following out of these tantulum instruments or in the development of some other alloy or metal instruments, so that it shall not be possible for the president of any organization to say there are only two or three men who are reaching the ends of root canals. We must reach a different status. If that is the average standard of dentistry to-day, we are going to have a lot of trouble within a very few years.

Dr. Callahan. It gave me very great pleasure, and I consider you paid me a very great compliment, when you brought Dr. Prinz here to discuss this subject.

There is not a man for whom I have greater respect, and I am only sorry I do not live in Philadelphia, where I could go over and be in his laboratory and be improved by him and his teachings at all hours of the day.

I agree exactly with all of you in regard to the radiographic instrument. I have been spoiled, because within a few doors of me I have a friend who does that work for me, and I have been so in the habit of running over to him that I have not had to do the work myself; and perhaps that is my reason for not having done it myself.

The placing of the wire in the root canal and photographing it, and all that sort of thing, is perfectly proper, and I do not see how you can get along without it here; but you have experts here in New York along

that line, and I tried to explain in the paper that I passed over the discussion of that because I did not think it was necessary in this community.

Dr. Rhein does not like to get the laugh in this work; but I am Irish and he is not, which reminds me of a story:

A household had employed a new cook—an Irish lady. She was called upstairs and she was asked, "Can you prepare for us a hassenpfeffer?" The new cook replied, "No, ma'am, I cannot; I can't even spell the darned thing."

A rising vote of thanks was offered to the essayist and the clinician and to the gentlemen who took part in the discussion.

Adjournment.

Second District Dental Society.

April Meeting

A regular meeting of the Second District Dental Society of the State of New York, was held on Monday evening, April 12, 1915, at the Hotel Bossert, Brooklyn, N. Y.

The President, Dr. Stevenson, occupied the chair, and called the meeting to order.

This year—when you have probably forgotten **President Stevenson.** its President and its officers—will be impressed upon you as a "root canal year"; and I feel, from talks with our members, that we are doing better root canal work this year because of the papers we have had. As the children say: "the last the best of all the game," so we have kept the best for the last, and quite appropriate with his name, we have Dr. Best with us this evening. He will read a paper on "The Responsibility of the Dentist with Relation to Pulpless Teeth."

Mr. President, members of the Second District **Dr. Elmer S. Best.** Dental Society, ladies and gentlemen: I have been having a very strenuous time in New York since I landed. I left my hotel this morning, and have not been back since; and I shall always remember this, my first trip to New York City. I have probably learned more in the same space of time in New York, than I ever have in all the time I have been interested in and studying dentistry.

(Dr. Best read his paper, which appeared in the July issue.)

Discussion of Dr. Best's Paper.

It gives me great pleasure to discuss this most **Dr. G. J. Grieves,** admirable paper; in the main I agree with the most **Baltimore.** of Dr. Best's findings, and we only differ in minor detail, which I will mention later. When Dr. Otto-

lengui asked me here I accepted, with the understanding that my portion of the discussion would be along the lines of the histopathology of the question rather than the technique. This paper bristles with so many suggestions that it is difficult to discuss it without writing another, so I am sure Dr. Best and the society will forgive me if I digress occasionally.

**Systemic Infection
from Tooth Roots.**

Five years ago I was able to report to this society, after two years' prior work with Dr. W. S. Baer, Orthopedist, Johns Hopkins Hospital, fourteen authentic cases of periapical infection of the blind type of chronic alveolar abscess, where all of the pathogenic elements were locked in the alveolus and conveyed to the distant tissues by infective emboli by way of the blood stream, which were surely associated with systemic disease. These patients had temperature, at periods, with muscle, joint and heart involvement. There was one case of anæmia and neuritis and others of general malaise of indeterminate type. The clinical picture was typical of a pathogenic alternating poisoning. These cases are recalled to your minds for two reasons: first, because at that time I failed to convince my audience of the seriousness of the situation, and when I stated in my paper that all of the infected roots of these patients were extracted save in one case, which was treated surgically by apicoectomy, which then made slow recovery, I was roundly condemned for sacrificing so many teeth, some of the members claiming by this particular treatment to save every abscessed tooth. Second, because there existed the impression that all of the systemic damage occurred by ingestion of pus, as from pyorrhea or fistulous abscesses. This I do not now deny, but still believe that the greater damage lies, as I then argued, in the quiet, apparently innocuous areas, which are often not recognized by the operator and patient.

Every thinking man in our profession now admits, I believe, the seriousness of the conditions arising from focal infective areas about the roots of teeth, but we do not at all agree on the means for preventing or curing such areas, nor are we a unit in interpreting the radiographs, which are frequently the only evidence that such areas exist.

**Reasons
for Extracting
Teeth.**

I wish to reaffirm my stand of five years ago, backed by all the evidence since accumulated, and to say that I know of no method, medicinal, chemical or electrolytic which will surely renew the vitality of the periapical tissues, producing or maintaining a blind infected alveolar area or so clear the area quickly, as to prevent possibility or reinfection. In the class of patients just quoted, who are sick frequently almost unto

death, from toxic periapical absorption, the only method confirmed and variously reported by me in the interim is that of surgery, and as apicoectomy is of doubtful value in multirooted teeth where these conditions most frequently occur, I have found extraction the only expedient. It is also recognized that this results in great mutilation of the patient's denture if not after denutrition, but in my mind there is no other way; with our knowledge to date it is the least of many evils, so we must distinguish sharply between the well and the sick in the treatment of abscessed teeth. No sacrifice of time or effort in those who are well is too great to prevent pulp infection or cure periapical involvement, but in the sick we cannot act too promptly. At the very basis of this question, I believe, lies the manner in which the attaching tissues of the teeth behave, particularly the periapical tissues, which are of even greater importance than the pulp for service after the process of pulp devitalization. Dr. Best has clearly shown us he can remove all of the pulp and sterilize and fill the canal into the very apex yet not through it, and I ask that you consider for a moment a few slides which may refresh our memory even if they appear rudimentary. (Illustrates with lantern slides.)

Histology of Apical Cementum.

Note that the apex of every adult tooth is completed not in dentin, but vital cementum according to the period of development. Prior to and during eruption, there is only the first lamina and further layers are successfully added according to age and use. So as Noyes says (whose illustrations I am using), if you study a number of sections of the teeth of a number of persons of the age of twenty and then of thirty and forty, etc., you will find increasing laminae as age advances, which are in greater bulk at the apex with many lacunae and canaliculi. Further the pericemental apex is much more open in structure and is supplied not unlike subperiosteal bone (which indeed it closely resembles), with nutrient juices in complete circulation, though the penetrating vessels are not so numerous as in bone. On these points all histologists agree, however they may disagree on the supposed circulation via the dentinal tubules, Tomes' granular layer and the lacunae and canaliculi from the pulp to the peridental membrane in the middle and gingival third of the root.

This is the process of normal cementum formation which, mark you, continues throughout life, and is accompanied by continual resorption at one point and deposition at another, as in the eruption of temporary teeth, and the record of every resorption and repair is written on the root of every tooth in the various lines and cuts in spots refilled, very much like the growth rings in a tree. This secondary cementum differs from the

primary in being more open structure with a greater number of lacunæ and canaliculi. So I would accent the fact that it is possible to say from the invasion and bulging of the regular circumferential layers, just how the fibres were reattached to meet stress from another direction or repair a trauma or an infection. I want it distinctly understood that this is not a pathological condition I am describing, and is most emphatically not hypercementosis, nor exostosis, but a normal physiologic deposit completing the adult apex of every normal tooth according to age, frequently closing smaller apical vessels (as shown in the slides). I believe it is by these deposits that every immediate foramen is after all filled, in successfully treated teeth. Many attempts at pulp devitalization surely interfere with the process; also the continued use of arsenic and of strong formaldehyde preparations (anything over five per cent.). The ionization of zinc in sodium chloride solution, the use of sodium and potassium or intentional perforation when we attempt to open a canal, will greatly endanger, if not surely destroy, the vitality of the apical cementum.

I would also call your attention to the fact that were these necrotic areas to occur in bone, they would in time be sequestered and exfoliated by local osteoclastic and phagocytic supervision, but the difficulty is that the middle and gingival fibres of the peridental membrane retain the tooth in fair function with no pain, so that the patient and often the dentist may not realize the danger of the retention and mastication on such a tooth. There is no such surgical operation quite comparable to pulp devitalization, where we devitalize one tissue, the dental pulp, and leave two, dentin and enamel, out of the six cardinal dental tissues, absolutely unnourished, to be retained by the other three, cementum, peridental membrane and alveolus, and we propose to accomplish this without the damage to attaching and nourishing tissues of the tooth. When infection, resulting in abscess occurs, the nearest approach in surgery to such an operation would be the treatment of osteomyelitis of long bones, and the operation for the removal and repair of the shaft.

Infections Through Pulp Canals.

The other element of danger to these tissues is infection introduced from the pulp through caries or in the dentist's processes just mentioned, and I wish heartily to commend all that Dr. Best has said in regard to his technique in guarding against every avenue of possible infection, although I do not agree that he can in a few minutes' application of iodine, alcohol, or of any sterilizing agent immediately sterilize the dentin of the field in which he is operating; for in the preparation of teeth for histologic study that takes hours, if not days, soaking in non-coagulating germicidal agents, and I much prefer



Items of Interest

and recommend the slow method of sterilizing these tissues before invading the apical regions. This can be done by sealing such agents in the canal with cement. I should fear with Dr. Best's method that I might infect my sterile instruments from the chipping of the tissues on which I was working, for the dentinal tubules of every tooth, which calls for this operation are saturated with pathogenic spores, as Miller has long ago shown.

Tissue Necrosis and Infection.

The two great dangers then, are, *first*, tissue necrosis, which I am sure you and I have induced in the past by our efforts to devitalize and sterilize and operate upon this area; and, *second*, infection, introduced into this necrotic tissue, which we have produced, which area, due to local cell destruction has lost its phagocytic and reparative powers and becomes a fertile field for microbic adaptation. So I should like also to commend heartily Dr. Best's other reference to the newer conception of surgery, that every cell be conserved and as little tissue damaged as possible, this conception going hand in hand with his recommendation to you of the aseptic rather than the antiseptic operation.

I am sure, from study of radiographs of fields before and after operation that I have frequently so lowered the local resistance of these cells we are considering, in my attempt at thorough pulp devitalization and canal opening, as to produce a necrotic apex, a nuisance, needing constant phagocytic supervision, open to infection from septic emboli, as Billings has shown floating; from other focal areas in the body and finally lodging on the apex to produce a blind focal area, previously uninfected; in short, endogenous or hematogenic infection.

Multiple Areas of Infection.

Now I want to say a word about multiple focal areas, and endogenous infection. There are few cases in my experience, where it can be proven that the teeth and teeth alone were the primary portal of entry. This does not excuse the dentist who handles the tooth, but further involves him. As I have just said he often produces the tissue necrosis, a nidus for metastasis, and again these secondary tooth areas are just as dangerous as the primary, for the case does not clear until *all* the focal areas are removed. There are usually three or more portals of septic entry, as the tonsils, sinuses, genito-urinary tract, the appendix, etc., etc. Septic emboli from these areas with an oxygen tension favoring adaptation and growth of facultative organisms, float away in the blood stream to lodge in distant periapical areas of tissue necrosis which we have produced in pulp devitalization, there to induce a secondary focal area even more dangerous than the primary, because it is not outspoken

in symptoms and gives little pain; "catching cold, which lodges on a dead tooth," as an instance. Of these forms who can say, with our present knowledge, in which lies the danger? This is the reason why many hospitals, as someone has said, are "accumulating a bushel of extracted teeth." Given a case in bed at the hospital, every tooth having a resorptive bone area, which must, for want of better knowledge, be the signal that degeneration and not regeneration is going on in alveolus, must be extracted, for again who can say which of these apical areas is producing the serious systemic state, and will any of us assume the responsibility of retaining the tooth at the risk of the patient's health?

I realize the seriousness of this situation and it may in time develop its legal difficulties. That is why I am here. I want to learn, and while I am perfectly convinced that Dr. Best is right when he says that every tooth associated with apparently open bone areas, judged by radiographs and clinical histories, are not necessarily a menace to the health of his patient, I wish Dr. Best or someone else would differentiate accurately. This is the key to this dangerous situation to our profession, but until we can decide which is noxious, and which is not, the sick in the hospital will have to lose all such teeth, for there is not time for continued dental treatment, nor will the internist consent to it. The main lesson is to prevent, or not to produce, conditions in apical areas, in the well patient, which may lead to infection, and this brings up the question of technique of the root canal operation.

**Multiple
Apical Foramina.**

I wish to call your attention to the multiple vessel openings shown in the slides, particularly as Broomell, Stein and Noyes have shown that in tooth formation these vessels enter the follicular wall of the papilla just as later they perforate the pericemental apex at more than one point above the main opening. These so-called "inoperable canals" are classed in another article by Dr. Best at ten per cent., and in one case he reports eleven openings for one molar root. From my study of these foramina, my percentage is twenty-five per cent. of all those examined, and the percentage is still increasing.

I want to ask the operators who favor perforating every apex, after seeing these slides and after studying decalcified roots out of the mouth, which one of these vessel openings would they follow, particularly with an agent so destructive of organic tissues as sodium and potassium, and how do they know, in looking into a canal or by examining radiographs which rarely show these openings, how many there are or what is the angle of approach, which is often ninety degrees to the main canal. They might answer: "Oh, well! All that part is resorbed, encysted or encap-



sulated." Then why not depend on that method, removing all of the pulp, just short of the apex, and let the process of resorption go on in vital cementum, without running wires out into the adjacent bone to get radiographs? Of course, we are considering only devitalization cases, and not the necrotic apex which I believe will rarely respond to any treatment.

You will also recall that Dr. Best reports out of two hundred and eighty-eight radiographs of pulpless teeth studied, "one hundred and seventy-seven mechanically defective operations, with rarefied periapical areas," and "forty-one mechanically defective operations without rarefied areas." Thus a little less than one quarter of the defective root canal fillings produced none of the resorption which we have spoken of as the danger signal. Why? What has taken care of this twenty-five per cent.? There is evidently some curative process guarding and healing this area, other than the mere technique of perfect root canal filling, and it has been my effort to discover how the parts were repaired as some of the slides will show and as I shall demonstrate in a later paper. This is a dangerous subject and what I have to say must not be misinterpreted, and used as an excuse for slovenly canal work or the use of mummifying pastes, "life savers" as Dr. Best calls them, at the apex. I join him heartily in condemning all of this "bluff" and wish to emphasize his statements. No condemnation can be too great for any process or operation that takes chances with the patient's health, for the health of the apex of a tooth is the health of the patient.

If infection of the periapical tissue, induced by necrosis or by alveolar abscess occurs, for which I have no remedy except careful sterilization, or ionization with iodine possibly, and as "pains taking" root filling as can be done. Follow this by the close study of a series of radiographs from time to time. If the field does not begin to clear shortly, apicoectomy, curettement or extracting are the only procedures, for I believe few chronic alveolar areas ever yield to treatment. Where they do recover, I think it can be proven that these apices are taken care of by nature's process, which are the same reparative processes which operate in other bone lesions, and that they are not cured by operative processes. This is said with all due respect to the perfect canal filling, for which I am keen and on which I have spent hours. No other operation is acceptable, but unless the damage you do in the treatment is repaired, unless the cells are in physiologic contact, no root canal filling, no matter how perfect, ever saved a tooth yet, if the attaching tissues at the apex were devitalized in the pulp devitalization, that we might save the patient pain.



**Should Root Fillings
Extend Through
Apex?**

My belief is (and I am sure it has occurred in some cases I have examined) that many of the canals will, on examination, show a pedicle of the pulp still remaining vital, with cementum which had not lost its vitality. Remembering that the dental pulp is after all an embryonic connective tissue with low reparative powers, I for one would not "gamble" on this occurring, for at any time a slight interference with circulation may leave the apical third of these canals filled with putrefying necrotic tissue, so far away as Dr. Best has shown from the phagocytic repair, as to become infected by endogenous means. I recommend nothing short of complete pulp removal as far as the finest of our fine files and broaches will reach, but I should rather stop at that, and place the finality of my filling in the hands of a vital cementum so near the vessel opening so that it may be subject to these reparative processes, than to have this root filling protrude into the periapical tissues. The protrusion of the gutta-percha cone seems to be quite the fashion now with many operators. In sealing the apex the question to be answered is: "In placing your filling, are you going, just to, or through the foramen?" Has anybody, except by chance, made as perfect a closure of the foramen as he would make his fillings over enamel edges? How do you polish the ends of your roots, the protruding end of canal fillings? I wish Dr. Best would make all of this clear to us. I consider the protrusion of gutta-percha cones sterilized and softened by chloroform, into the periapical tissues we have just mentioned, as a bad surgical procedure. I am aware of what has been done with metal plates, celluloid tubes and aluminum pins in bone, and that new bone has grown with all of the parts at rest about such foreign bodies, but if you will recall the slides you will see that in the periapical regions it is a vastly different proposition.

You are invading a joint, and in passing the cone beyond the tooth you are only limited by the previous destruction of tissue; if resistance be met, the soft gutta-percha mushrooms on the apex, or encapsules it. In a sinus the cone is extended until it comes in contact with the top of the wall and twists into a veritable "pigtail."

This protruding point may have new bone built about it to a degree, as some radiographs appear to show, but a careful study will reveal a rarefied area near the canal opening which would condemn any other root where the filling did not approach the apex. There is always some point where bone is just about to be formed, but is not. We must also remember that this is a joint, that you have passed through the fibres of the periodontal membrane into bone, and that normal teeth sway and sag in proportion to the stretch of the periodontal fibres and the impact of

occlusion. In the majority of these cases there is great sway, and surely our friends who claim new bone to be built about a foreign body, would say that much would depend on its being at rest and not in motion, even occasionally. Suppose we grant that there is a complete deposition of new bone and that fresh fibres are built immediately about the gutta-percha, and later the approximating tooth is lost and our root tilts, how about this area? Or suppose that these same roots are used later as bridge abutments, how about the relation in the added stress on the bit of tilting gutta-percha then? I have seen many bits of amalgam, points of instruments in encysted root, ends of gutta-percha points at rest in the alveolus, unknown to the patient, or operator, until discovered by radiographs cared for by years of bone repair; but these were not in occlusion, nor did the root project in the mouth. So also are there many cases of bullets, pins, needles, fish hooks, etc., lost in and cared for by the fibrous tissue (which, by the way, make their presence felt at any period of lowered bodily resistance), but who would maintain for a moment that it is good surgery to deliberately introduce such foreign bodies? Finally let me repeat the axiom that, "for repair and health of the tissues every cell must lie in physiologic contact with every other cell." There can obviously be no physiologic contact of bone and periodontal fibres with gutta-percha, no matter how sterile. Why not let the giant cells and phagocytes perform their function on non-infected or even infected cells of bone, cementum and fibrous tissue with which they are prepared to deal, instead of introducing a foreign substance?

After two years' study of specimens, ground and decalcified sections of root apices, the histories of which are known, some of which I show you on the screen, I believe it can be established that the apical cementum of the root of every tooth which is successfully treated and filled is absorbed at first down to the point where the cells can lie in physiologic contact, after which there is a secondary deposit of cementum, attaching new fibres of the periodontal membrane, the only means by which they can be attached. This can be proven by the difference in the appearance of the secondary cementum, the interference with the regularity of the lamellæ and the hyperplasia at the apex. This is in no way a hypercementosis, nor should it be mistaken for a pathological condition; in fact, it is extremely difficult to draw the line between the normal deposits late in life and cemental hyperplasia. I believe that the filling which finally seals the apex after our best work, and has sealed in the past the buccal roots of upper molars, for instance, is this deposit of secondary cementum, and that it cannot occur in the presence of infection: you will notice in some of the specimens known to be infected, how it is walled up to the very point of infection. So we really never cure an alveolar abscess, un-

less all of the necrotic tissue is removed and the cells can again lie in physiologic contact. After all, the vitality of all the periapical tissue must be preserved or the root canal filling, no matter how perfect, will never restore them to normal relation.

In closing I wish to think Dr. Best and the society for the privilege of hearing and discussing this conservative paper and to compliment him on the results of his work as shown in the radiographs.

We have a number of our medical confrères
President Stevenson. with us this evening, and they attest by their presence, as they have on other occasions, that they are deeply concerned in this subject. We know of no one who can discuss this subject from the bacterial side better than Dr. Van Cott, who is the professor of clinical medicine and bacteriology in the Long Island Medical College.

While listening to this very remarkable paper,
Dr. Van Cott. I must confess I have wondered what right I had to be here; and I was only comforted by looking about and seeing an obstetrician here, and realizing that at least fifty per cent. of his cases had no teeth at all.

It is extremely interesting to me to have heard a man who seems to have absolutely grasped the fundamental principles announced by the men who are the founders of the science of bacteriology.

Infection is the invasion of living tissue by microparasites. Dr. Best has conceived the postulate of Koch, the appearance of the organism, the dose, and the resistance of the host. He is fighting the question from that standpoint, the virulence of the organism, and the resistance of the individual himself.

Dr. Grieves has shown some most beautiful slides, and I am coming pretty close to asking for a diploma in dentistry. This shows us that it is the knowledge of this tissue on which you men are working, that is in a large measure responsible for the combatting of disease.

I have witnessed something over 4,000 autopsies, and the question of the infection through the teeth is by no means devoid of seriousness. I have seen demonstrated time and again the fact that a systemic infection may result from something allowed to remain in or about the teeth.

I remember one case that Dr. Turner knows of—a man who died from an infection—he had temperature and trouble, and he failed to attend to it, and he developed a malignant endocarditis which was traced to the teeth. I have seen the sinuses involved, where the teeth were certainly at the bottom of the infection.

As we do in medicine, you sometimes get immunity, and escape trouble. Sometimes because the patient has an immunity similar to that of the



white rat from anthrax. Some individuals will resist bacterial infection, but there are others who can only resist infection to a certain degree; and it seems to me that is one of the points that one never knows—whether your patient really has a natural immunity.

I was a little disappointed in not hearing from Dr. Best on the subject of vaccines—whether he has used them in his efforts to control the infections in this territory.

I remember as a growing boy, in my impression of dentists, that there were some people in those days who looked down upon them, and I never could see that point, because it seems to me systemic immunity is often the result of careful dentistry, and resistance, which is one of the elements of Koch's postulate, is often the result of careful dentistry.

**Antiseptics
Useless in
the Mouth.**

I certainly agree with what Dr. Best said about local antiseptics in the mouth. It is absurd. Bacterial investigation has shown that anything that will kill these virulent organisms will kill tissue, and will do more harm than good, as these gentlemen have said. Think of trying to sterilize the teeth with these germicides that are advertised! Either they do not exist as germicides, or they exist as harmful agents which should be left alone.

I want to say a word, but I do not know how
Dr. Chaddeus P. Hyatt. it will be greeted—I know how some of my remarks in the past have been received. I have listened intently to all the talk this evening on pulp chambers and root canal work, and while it would be fascinating to equip my office with all the paraphernalia necessary to do this exquisite work for the preservation of pulpless teeth—I think it may be so fascinating that we might overlook the most important part—which is never to have such teeth to take care of. I think that can only come about by the wise instruction by the dentists of the public, so that they will take care of their teeth. I do not think there is a baker's dozen of men in this room who can really claim that they are doing this work properly—and that may be a bold thing to say—but we hear men say they are only taking a half hour for such work, and they do not want to waste their patient's time, and they are men for whom I have the greatest respect. Either I am mistaken, or I am ahead of time, but I think the greatest work for us to do is to try to discover how we can prevent the dental lesions, and never need to use arsenic or pressure anesthesia to take out the pulp, and then we will not have to do the things that were shown to-night. That is the great point, the preventive measure, rather than this fine technique and the wonderful instrumentation for the removal of the pulp from the pulp canal.

I think preventive dentistry can be practiced, and I think in the

future the dentist will study more along those lines, and all these other troubles will be prevented.

Most of you are aware that I am somewhat interested in this subject, and I feel that I do not want to let this occasion go by without complimenting Dr. Best on the magnificent presentation he has given us to-night.

Dr. M. E. Rhein.

It has been a great pleasure to me in looking at his radiographs to see that he has practically grasped the point of absolutely sealing the entire foraminal ends. In a conversation with Dr. Best this afternoon, I learned that he was erroneously under the impression that I deem it necessary that the root filling should protrude some distance. I am very sorry if my use of the English language has been such as to have conveyed any such erroneous conception.

In trying to demonstrate the results, which I have obtained by many years of clinical research devoted to this particular subject, I finally concluded that it is absolutely necessary that the foraminal end should be sealed, and that means that the minutest crater must be sealed, from the periapical aspect, if such a root is to be left in a condition where future infection is impossible.

I realize that this is entirely in accord with Dr. Best's views.

I want to say a word in regard to Dr. Grieves' discussion. We are all human, and liable to error. Either Dr. Grieves is wrong, or I am wrong. I base my statement of facts on both bacteriological tests and radiographic proofs, taken years after the work has been accomplished.

I do not agree with Dr. Grieves' patho-histologic presentation which he has given us. He speaks of the deposit of cementum around the apices of the roots in this extraordinary way, and calls it physiologic. If we view a great many radiographs of teeth, we will find that only a small percentage presents this condition of affairs, and this condition, while it is unquestionably an act of Nature trying to protect itself, is pathologic. It is due to an irritation which produces the excessive amount of nutritional matter; that brings about exostosis.

It is the first time I have ever heard anyone make the claim that this can be considered a normal condition.

In his discussion Dr. Grieves lays great stress on the difficulty of sealing multiple foramina when they exist, and he is right. Unless all these microscopic entrances to the pulp canal are sealed, the operation cannot be considered a success, and my claim is that the technique must be of such a nature that all these canals will be sealed, not in a haphazard way, but hermetically sealed with such a homogeneous mass, that there is absolutely no possibility of any leakage.

One of the strongest clinical facts in contradiction to Dr. Grieves' presentation, has been my record book in regard to many cases—I may say a few hundred cases—where, what we formerly would consider a very creditable root filling extending almost to the apex—not through—in some cases not as far as that—were followed by a pericementitis and by the loosening of a tooth that was formerly tight, and there is an exudate. I leave it to you my fellow practitioners, when you have thought that you did an extraordinary good piece of work and this has been the result, what is the reason?

The reason is, you have left at the end of the root living tissue such as Dr. Grieves has presented to us, but the condition is abnormal, it is pathologic. We get the inflammatory reaction that produces this hypercementosis that follows. It produces the pericementitis. It makes the tooth loose without apparent cause. Over and over I have followed up such teeth that have come back after the first operation, and in the second treatment I have filled through the foramen, after using sodium and potassium, which by its marvelous facility for searching out every particle of organic tissue, if properly used, had removed from the apex all those microscopic contents, and the result always has been that the pericementitis has disappeared, the tooth become tighter at the end of twenty-four hours, and the exudate has disappeared.

Now as to what he said about passing a large mass of gutta-percha through a foramen. We do not aim to pass through a large mass. But when it does occur, if aseptically done, it is encysted. I have the radiographic proofs to show that osseous regeneration takes place, notwithstanding the fact that a large mass of gutta-percha had passed through. I did not want to pass that mass through there. Such an occurrence simply shows the limitations of my own skill; but I do claim that when you get osseous regeneration years afterwards—when the destroyed bone shows that it is being replaced, it is to my mind very good scientific evidence that the mass of aseptic gutta-percha was harmless.

I have said many a time that the percentage of cases that can be treated, so that reinfection cannot take place, is dependent on each man, and when it cannot be done, the tooth must be extracted. I do, however, in the cause of conservative dentistry, feel that we should not forget the inordinately great value of the human tooth, as compared with any artificial substitute. There is such a thing as going to extremes in the loss of the human teeth.

I had the honor, at what was known as the White Mountain meeting of the ITEMS OF INTEREST, of introducing to the profession at that time, the great value of ionization for absolutely extirpating foci of infection,

if the root of the tooth itself was not necrotic. I have not a single case up to the present time on my records to contradict that assertion. I have had a number of cases where, through the difficulty of properly reading a radiograph, I have attempted ionization, and had to have recourse to apicoectomy afterwards, because the root itself was necrosed; but under no other circumstances have I met failure.

I do not want this occasion to go by without laying due emphasis on that; because if it were necessary always to resort to apicoectomy, a great many useful teeth would be sacrificed that can be and are properly being saved.

I am deeply interested in the subject under discussion, but I believe it would be unwise for me to consume time discussing root canal technique. I do want to take a few moments in stating what I believe to be a greater problem at the present time than the working out of a perfect root canal technique, though the one problem, in a measure, is dependent upon the other. The sad reality faces us to-day that our hospitals are filled with patients who are bed-ridden; some crippled for life and aye, many of them dying, as a result of focal infections about the teeth and jaws. There is no longer any question as to the large variety of systemic diseases that are due to oral infection, and herein lies the great problem that is before you gentlemen to-day. I dare say if you would come to the Post-Graduate Hospital and School of Medicine on any Thursday morning (and I extend the invitation to each and everyone of you to do so), you would be astounded to see the number and character of cases that are sent down to my clinic in oral surgery from the medical and surgical wards. In most every instance, a radiographic and bacteriologic study of infected areas in the mouth reveals the relationship between oral infection and systemic disease. Some of the cases with cardiac lesions and others with pernicious anæmias succumb to the disease because they reach us too late to be benefited by our treatment, yet many of the cases respond to the removal of infection from the mouth and jaws and the use of autogenous vaccines. In the cases of polyarthritis, where structural changes have taken place within the joints and atrophy of the limbs have resulted from prolonged non-use, only slight improvement will take place because the damage is too great to permit of repair. It is therefore incumbent upon you to exert yourselves in the direction of prophylactic measures and thus prevent these serious diseases of mankind, rather than advocate futile efforts at curing them when the damage has been done.

It is well for the masters in dentistry to work out a technique for the treatment of pulpless teeth, but there is this greater problem before you; what are we to do in the meantime?

**Evil Results
from Evil
Bridgework.**

I have noticed in the study of hundreds of cases in our wards that the patients who seek charity at our hands give evidence in their mouths of having spent considerable money for the type of dental work that is common in the dental parlors and among un-



Fig. 1.



Fig. 2.

scrupulous dentists who are putting gold crowns and bridges in mouths, without regard to the damage that such work produces. In view of our present knowledge of the dangers of such practices, *it should be considered a crime to put a gold crown or bridge upon a tooth, unless that tooth is properly prepared to receive it.*

Radiographs of the part is the only sure means of determining whether a healthy condition exists about the apex after the root canals have been treated and filled. Crowns and bridges must therefore be considered a luxury, which should only be indulged in by wealthy persons, and no work of that character should be attempted in the light of our present knowledge upon poor patients unless similar methods are applied.

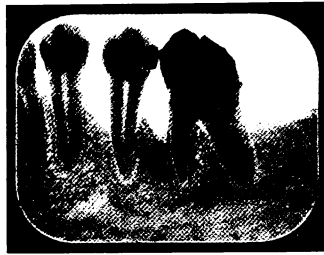


Fig. 3.



Fig. 4.

Evils of College Infirmary Work.

Think of what is going on in every dental college to-day! Students who have but the slightest chance of treating a root canal properly are permitted to practice upon living subjects. Many of you who are in practice for years find it your greatest difficulty. Is it not a crime that our dental colleges should take such a risk with the health of the confiding patients who come to their clinics? Persons so treated in most every instance are taking a risk almost as great as if they were inoculated with a poison which sooner or later will sap their vitality and end their lives. If we do not take steps to end this nefarious crime, the government will. There are laws enacted to protect the health of the public through providing pure food, free from any dangerous in-

gredients, even though used in small quantities. Our municipality is spending vast sums of money in the preservation of health, and I wish to say that when the public, backed by the medical profession, begins to realize the full amount of harm that is being done through poor and inefficient dental work, there will be an upheaval that will cast reflection,

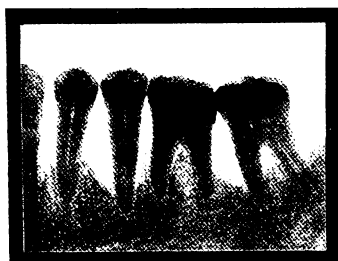


Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.

not alone upon the unscrupulous practitioner but upon you men as well, who are anxiously and seriously thinking of this question from your own standpoint. I claim this is the big problem before you to-day, and it is necessary for you to solve it lest it be taken from your hands.

In speaking to Dr. Ottolengui on the telephone to-day, I promised him to bring along a few slides to illustrate some pertinent points bearing upon the subject.

The first picture (Fig. 1) is a radiograph of the hands of a patient showing a normal appearance of the joints. Fig. 2 shows the condition known as arthritis deformans, from a radiograph which I made for a patient many years ago who was suffering from pyorrhea and in whom I suspected the relationship between the two diseases. You can well

imagine from the appearance of these joints that even after the removal of the mouth infection, little benefit would be felt from the treatment, even though autogenous vaccines were administered.

Fig. 3 shows the great amount of resorption of the alveolus that takes place about the necks of teeth as the result of pyorrhea. It is an example of the type of case that can be cured by thorough treatment, namely thorough instrumentation and medication so as to remove all deposits from the teeth and all germs from the pyorrheal pockets. At this



Fig. 9.



Fig. 10.



Fig. 11.

point, I desire to state that it is possible to cure pyorrhea but extremely difficult to prevent its recurrence.

Fig. 4 shows extensive pyorrhea with marked infection about the teeth, that was responsible for a pronounced case of polyarthrititis. It would be wrong in a case like this to treat these teeth with a view to saving them, and I wish to take serious issue with those men who are so eager to practice their specialty and try their skill, that they are ready to endanger the life of the patient rather than resort to free extracting in such

instances. We need a few hundred Billy Sundays to go through the country before the members of the dental profession to preach, not alone the doctrine of prophylaxis, but the wholesale extraction of teeth when they are likely to menace the health of our patients.

Figs. 5 and 6 show pyorrhea with deep pockets in two patients that had suffered systemic effects. Fig. 7 illustrates the manner in which the instrument is passed up beneath the gum flap and the tooth so as to permit of the scaling of the root at the extreme depth of the pocket. Fig. 8



Fig. 12.



Fig. 13.



Fig. 14.

shows an extensive resorption of the process about an upper second molar tooth and infection between the roots of the first molar as the result of a perforation at that point. Fig. 9 shows an extensive apical infection involving the roots of the upper central, lateral and cuspid teeth. The patient had no local symptoms to indicate that she was suffering from so an extensive destruction within the bone. Figs. 10 and 11 show extensive areas of infection in the bone above the teeth as the result of poor dental work. One of these patients was a chronic invalid suffering from a disturbed condition of her nervous system with persistent insomnia which was amenable to no treatment until I operated upon the patient cleaning out the large area of disease. Figs. 12 and 13 show infection about the apices of teeth that were free from caries and which gave no external evidence of the disease existing about the roots. The bicuspid in Fig. 12 contained a putrescent pulp which had evidently died from some trauma. Fig. 13, though strongly suggesting an apical abscess due to infection

from the pulp canal, was a vital tooth surrounded by a pericemental abscess of pyorrhea origin. Fig. 14 is an excellent illustration of the difficulties that you gentlemen encounter in the treatment of root canals. Here are three adjacent teeth, each one showing its own peculiarities as to root formation and arrangement of the pulp canals.

I hope I am not attacking this subject from too unpopular a standpoint. Dr. Grieves has referred to the bucketful of teeth found in many of our hospitals. I do not discriminate, as he does, between those persons who are well and those who are sick. It is much more important for us to preserve the health of patients than to attempt to cure them after they are stricken with a deadly disease. I think much good would come from the more free use of hygienic plates, and the elimination of unhygienic bridgework.

I want to make myself clear on one point. I have used the expression "flush with the surface—through the foramen—sealing the foramen"—but I do not seem to have conveyed my idea. Dr. Grieves misunderstands me, and Dr. Rhein misunderstands me. I am going to use an illustration; it is rather a coarse one, but it may convey my idea. We will say, for instance, we have two holes cut in this table. We have a large knife, which just comes even with the surface of the table. We will say that Dr. Grieves has his head through this hole and Dr. Rhein through that one, and the knife comes along and just takes off both heads (loud laughter)—which God forbid should ever happen. What we have left is flush with the surface. Now do you understand what I mean? (More laughter.)

Another point Dr. Rhein raises is in regard to preventing future infection. If the periapical tissue is infected, and Dr. Rhein does not sterilize it with his ionic medication, it matters not how he encapsulates the root apex, he will not have cured the infection. That is the dangerous point.

**Vaccine
Therapy.**

I differ with some of my dental friends in regard to the vaccines. There is so much of this work to do, that I find myself daily limiting the things I am attempting. I think the internist with whom we co-operate should do our vaccine work. I may be wrong, but I do not believe I have any right to use vaccines on my patients. I firmly believe that it is the field of the internist, and when he sends a case to us and says: "I have gone over this patient, and examined him thoroughly for every focal point of infection, and I cannot find one, and I hope you will find it"; when the internist is willing to adopt that position, let us turn over to him the work which I believe rightfully belongs to him.

Dr. Schamberg raised the question which is spreading with more or less rapidity among physicians and surgeons. The initial attack we got from Dr. Hunter. Although we resented it at the time, I believe it has done more for us than anything that could have happened to us. Many of us did not believe it at first; but when we analyzed the situation, we found he was right. At the same time, I cannot accept Dr. Schamberg's statement that crown and bridgework cannot be placed in the mouths of many of these patients to advantage. I believe that a crown properly contoured, and with proper anatomical restoration, does more good than if that tooth were replaced with an artificial substitute.

I appreciate more than I can express to you the spirit in which this paper has been received. I consider it a compliment to the Second District Dental Society, that not once has that old cry been raised: "How are the people going to pay for it?" It used to be raised every time the question was brought up, and that is a question which I cannot answer.

I thank you more than I can express.

Dr. Ottolengui. Dr. Schamberg feels he has been misunderstood, and he would like to say a word more.

Dr. Schamberg. I would not want to be quoted as disapproving of all crowns and bridges; but I believe it is essential that the practice be restricted to *good* crowns and bridges. The gentlemen collected here are but a handful of the men who are in the profession—and there are thousands of men who are turning out work that is doing more harm than good.

The hearty thanks of the society was voted to the essayist.



Review of Articles and Discussions on Root Canal Treatment.

During the winter we have been withholding various articles dealing with the subject of root canal treatment and filling, and the treatment of periapical infections, with the intention of publishing them all together as a symposium, that the student might have varying opinions in juxtaposition for his consideration. The material, however, proved too voluminous for the space available in a single issue, so that some appeared last month and more will be found in this number.

Root Canal Pastes.

The use of a plastic substance of some sort, which in theory at least will fill a canal if all pulp tissue be removed, and preserve what is left, if any be left, maintaining the same in a condition immune against the attacks of micro-organisms, is so attractive a method that it is not strange that the recommendation, varying only in formula, is presented so frequently. If comment is now made upon Dr. W. I. Prime's communication, it is by no means personal, but merely to emphasize the errors of his proposition as a lesson to hundreds of others who hold quite the same notions and practice in quite the same way, only, perhaps, without the courage to confess in print.

The salient points in Dr. Prime's paper are: First, he never uses the dam, but trusts to washing out canals with tepid water and instrumentation to cleanse his canals. Then a paste is forced in until the patient gives a signal for stopping, because pain is felt. In the presence of

putrescence he relies on phenol applied on paper cones and repeated till there is no odor.

Thus, in spite of all that has been written of the dangers of systemic infection from periapical abscesses, this practitioner is willing to recommend over his own signature the treatment of root canals unprotected from the bacteria in the oral cavity, and to count a root canal to be sterilized on the day when he cannot detect the presence of bacteria with his olfactory organ. It is to be hoped that Dr. Prime and others who share his views will really read all the papers and discussions in relation to root canal work in this and the last issue, and that they may profit by what the real students have to say.

Reverting, however, to the subject of canal pastes, so long as men can purchase these sure-pop cures for all root canal troubles and rely upon the lies on the labels to salve their consciences for adopting these lazy man's methods, it is almost useless for the chemical scientists to declare that the pastes are worthless.

**Duty of the
National Dental
Association.**

If the reorganized National Dental Association really means to emulate the methods of the American Medical Association, after which it has been patterned, it is high time for the Research Commission to attack this question of nostrums. All these canal pastes should be scientifically tested, and when proof has been accumulated that they are not only worthless, but actually harmful, since by the engaging advertisements that go with each package, dentists are tempted to fill canals with them, with the result that thousands of innocent patients have their health and lives endangered, then the National Dental Association should petition the Federal authorities to prohibit the further sale of such dangerous compounds.

We have been asked whether the dental profession will take the next step which must be taken in preventive medicine. This is the step that should be taken. The prevention of the continued poisoning of the people by abscesses resulting from the use of these baneful nostrums. We have been praying for this grand National Dental Association, and bragging of what we would do with the organization. Well, the day has arrived; we have the organization; the opportunity is ours. What are we going to do about it?

**Antiseptic Canal
Operations.**

Dr. C. Edmund Kells denies the possibility of aseptic root canal operations, and advocates the use of antiseptics; but in this symposium he will find none to agree with him. Not only is it declared that the aseptic root canal operation is possible, but both medical men and dentists claim that it is worse than useless to rely upon antiseptics. The classic surgery of to-day removes all infected tissue with aseptic instruments and hands, after which dressings are used, not charged with antiseptics as formerly, but with such agents only as will maintain the immunity of the wounded parts, contributing to healthy granulation tissue, and serving as a barrier against the inroads of pathogenic micro-organisms. This is just as essential in root work, or in periapical surgery, as elsewhere in the body, and no other course offers the slightest promise of a permanent cure.

It is true, as Dr. Kells says, that the vast majority of dentists to-day are not doing aseptic surgery when dealing with root canals; it is, as he announces, a pernicious practice to wrap cotton on a broach with dirty fingers and place that cotton as a dressing into a root canal. But it is possible for men to wrap cotton on their broaches with their fingers covered with rubber shields taken fresh from alcohol jars and using cotton which is continuously kept in the sterilizer.

No, it will not answer to rely on antiseptics, because our fingers are dirty. We must recognize the danger to our patients of treating their root canals in any but the most aseptic fashion, and then we must sit at the feet and learn from those who have perfected aseptic methods of practicing in this important field.

**Protrusion of
Canal Fillings
Through Foramina.**

Dr. Clarence Grieves in this issue, in discussing Dr. Best's paper warns against the protrusion of a canal filling through the end of a root, while Dr. Rhein and others contend that no root canal which has been putrescent can be counted as properly filled unless the canal filling passes quite through the foramen, thus perfectly sealing the same.

Thus is set up a distinct difference of opinion, and the sooner this controversy is determined the better, because of the prominence of the two men. Certainly Dr. Rhein's long and arduous labors in this field,

and the fact that he has practiced his method for a great number of years, keeping voluminous radiographic records and case histories, entitles his views to the most serious consideration. On the other hand, the fact that Dr. Grieves cites Drs. Black and Noyes to the defense of his views in regard to renewed growths of cementum about the ends of the teeth, makes one feel that the subject must again be carefully studied.

Dr. Grieves tells us that these growths are physiologic, while Dr. Rhein declares that they are pathologic. Dr. Grieves describes what he calls secondary cementum as "a process of normal cementum formation which continues throughout life," etc., etc. But he does not make it clear that this can occur, or that it does occur after the death or removal of the pulp; and if it does, why should it be counted physiological? Is secondary dentine, the product of a perverted stimulus set up within the pulp by some irritating agency, a physiological or a pathological tissue.

Dr. Grieves opposes even the encapsulation of the end of a diseased root with gutta-percha, and declares, even where regeneration of bone is shown by radiographs under such conditions, that he can detect an area of rarefaction close to the gutta-percha and just at the apical foramen. Of this he says: "There is always some point where bone is just about to be formed, but is not."

This argument is based largely upon a reading, or perhaps upon a misreading of the radiographs which have been exhibited. The places which Dr. Grieves claims show rarefaction are merely places in which no actual bone has been laid down, or else where the bone if present is not sufficiently dense to stop the passage of the X-ray. This is not rarefaction in the sense in which the term is used in diagnosing diseased tissue, nor to the eye of an expert does one look at all like the other.

It would, of course, be a satisfaction to those that claim they can cure periapical disease to be able to prove conclusively the entire filling in of the abscess cavity with new bone. But the success of their advocated methods and the soundness of their doctrines do not depend upon the restoration of new bone. It is quite sufficient if the parts are restored to health and all disease eradicated. These men would be quite contented if skillful dissection, by competent anatomists, would find those little places near the foramina which Dr. Grieves calls rarefied, to be filled with healthy granulation tissue. That this is the case is most

probable. That these so-called rarefied areas are diseased, or even prone to disease, case records abundantly prove not be the case.

During the discussion Dr. Grieves challenged those present to tell him how to differentiate between the curable and incurable cases. None replied, but there is no difficulty about replying. Those who are skilled in reading radiographs can readily detect a truly necrotic apex, and in such conditions, apicoectomy usually is a reliable procedure, though, as Dr. Grieves truly points out, not so useful in the molar region. Where there is no actual death of the end of the root, or where its existence cannot be positively determined, aseptic root canal treatment and filling promises a cure, and if the promise be not fulfilled the end of the root may even then be amputated, with the assurance that the main portion of the root is not a contributing agent in the continuance of the disease.

Of course, Dr. Grieves argues soundly when he declares that with the patient ill in bed, suffering from infection which might be traced back to the tooth, the internist is entirely within his rights when he sacrifices a tooth or teeth rather than risk the life of his patient.

But Dr. Rhein also is correct in making a plea for the salvation of all teeth where opportunity affords. If the patient is not bed-ridden, and can make the visits to the office, it not infrequently happens that from the very initiation of treatment a betterment of conditions begins, so that the patient is increasingly able to endure the sittings needed. And in the end he not only has his health, but likewise his tooth or teeth.

It is to be hoped that Dr. Grieves will continue his researches, as well as all the others who are at present teaching and preaching better methods, with the hope of attaining better results.

Prominent in this field we have always had Dr.

Callahan's Methods. Callahan, and his two papers in this issue should

be carefully studied. We have long had his views on the use of sulfuric acid, but it is most interesting now to read what he says of the use of sulfuric acid after the utilization of sodium-potassium. And one is immediately desirous of experimenting with the process suggested by Dr. Herman Prinz; the substitution of hydrochloric acid and sodium dioxide for the sulfuric acid and bicarbonate of soda. If the results are but half so good as promised they will be most useful.

In regard to Dr. Callahan's rosin method, that likewise seems a very



rational and useful proposition. But when he speaks of pumping a cone up and down in a canal forty or fifty times, finally getting it to the end and forcing the rosin into the dentinal tissues, it is evident that he can enlarge canals to a larger bore than most men.

**The Problem
Yet to be
Solved.**

It would seem, then, that we have practically perfected the technic of chemically cleansing out canals, and where they are large enough we have most satisfactory methods of filling them. We still need a safe mode of enlarging the canals after cleansing, so that we neither fill them up again with débris nor drill false pockets into or through the sides of the canals.

For this we require a better system of instrumentation, and for this we must have better instruments than have yet been devised. But several minds are at work on this problem, and it will undoubtedly be solved.





THIS IS THE TIME of year when some folks do their "Spring Cleaning."

- ❖ I never hear of "spring cleaning" myself but I think of the Dear Old Lady down at Atlantic City who rents out bathing suits, and openly declares it to be her opinion that "everybody ought to take a bath once a year, whether they need it or not." However that may be, I have been doing a little "spring cleaning" in and about my desk, and I have collected several communications which have reached me during the past few weeks, intended for discussion, Around the Table, but which thus far have been overlooked in the talks. They are not exactly all on the same subject, but it is possible to take a number of different colored little stones and put them together so that they form a fairly good picture. So we will just glance through the letters and comment thereon.

❏ ❏ ❏

DR. PRESTON, of Roanoke, Virginia, writes as follows: "My partner, Dr.

- ❖ Porter, tells me of his visit to your office recently, on which occasion he saw you use wax instead of unvulcanized rubber for pressure anesthesia. May I call your attention to another method? Prepare the cavity as usual, put in the novocain, neurocain, or cocaine, coat the cavity margins with a cavity varnish and use temporary stopping. The varnish prevents slipping and leakage, and the stopping 'stays put' when pressure is applied. The cavity may be overfilled if you wish the patient to supply the pressure by biting, but cotton need not be used as would be required with the unvulcanized rubber, as the solution does not escape into the patient's mouth. I have found this method better than any other that I have tried."

❏ ❏ ❏

I HAVE NOT TRIED this method as yet, but it sounds good, all except

- ❖ that about allowing the patient to bite on the gutta-percha. That would seem to indicate that no rubber dam is in place, and the Professor of asepsis, a prominent member of the Around the Table Club, insists that no pulp operation of any sort should be attempted without



- ❖ the protection of the rubber dam. He says it is hard enough to perform an aseptic operation with the dam on, but absolutely impossible to exclude infection otherwise.

■ ■ ■

THIS IS ONLY *en passant*, as we Frenchmen say, to which we may add

- ❖ "*revenons nous à nos moutons*," which in New York English means getting back to the main subject, which is pressure anesthesia. When first described for pulp work the use of unvulcanized rubber was advocated, and it did have the disadvantage of permitting the escape of the fluids. But once I was in Chicago, and I informed Dr. Hart J. Goslee that I wished a pulp removed. He offered to remove it for me painlessly! Painlessly, with a capital "P." That sounded very good to me; but while I wanted the demonstration, I cannot say I was so eager about it that I kept reminding him of it every three or four minutes. In fact, it was three or four days later, and just half an hour before my train was to start, when I remarked in a casual, impersonal, absolutely disinterested sort of way, "Oh, by the way, Goslee, we have forgotten to remove that pulp of mine!" Now, that was not what one might have called strictly true. He may have forgotten about that pulp, but I should not have said "we," because I had not forgotten it for one little minute.

■ ■ ■

VIRTUE IS ITS OWN REWARD, say some of the philosophers, and I

- ❖ suppose the liar reaps his own crop of regrets. At all events, you can imagine my feelings when Dr. Goslee remarked, "We have plenty of time; we will do it at once!" That gave me the first real inkling of what patients must think of us sometimes when we pass them little jests like that. But what could I do? However, why burden you with the harrowing tale. Suffice it to say that I caught my train, minus the pulp, suffered absolutely no pain, and, as they say, "went on my way rejoicing."

■ ■ ■

THAT WAS MY FIRST introduction to pressure anesthesia using bee's

- ❖ wax, and I have adhered to the method ever since. Do you blame me? As I said before, I have not yet tried the temporary stopping method, and it may be superior to the wax, but one advantage of the wax is that it yields nicely under pressure, and finally the burnisher may be pressed hard enough to go through the wax, and when this can be done without pain, the anesthesia is complete.

■ ■ ■

HERE IS AN INQUIRY all the way from Vancouver. Dr. B. S. Hanna

- ❖ asks: "Do you know anyone who has examined a tooth under the microscope to see the effect on a cavity soaked with nitrate of silver and then plugged with amalgam? I have often wondered if there is any union between the silver of the nitrate and the amalgam, which would prevent the recurrence of decay forever, or nearly so. I have often done this and have never had to remove a filling."

■ ■ ■

I CANNOT ANSWER this question. To be entirely frank, I never heard

- ❖ the method before. Moreover, it is difficult to see what is to be gained
- ❖ by the use of the nitrate of silver. Usually amalgam blackens a tooth
- ❖ quite enough without any additional factor, though whether the nitrate
- ❖ of silver would cause discoloration under the circumstances is yet another question. Nitrate of silver has been used in deciduous teeth and
- ❖ on sensitive surface abrasions with more or less success. In the latter
- ❖ case the theory is that the acid mucous causing dissolution of the
- ❖ cementum and dentine about the neck of a tooth exposes the dentinal
- ❖ tubuli, so that that portion of the tooth becomes highly sensitive, and
- ❖ the application of a concentrated solution of nitrate of silver supplies a
- ❖ surface covering, which protects the part from further irritation.

□ □ □

THE USE OF SILVER NITRATE, however, usually causes a discoloration which is most unpleasant, especially in the front of the mouth. For the incisors and cuspids, therefore, usually a preferable and equally potent method is to use a smooth burnisher in the engine and burnish the sensitive place at the neck of the tooth, using considerable pressure. The theory here is that the forceful burnishing closes the openings of the dentinal tubuli, and thus sets up a temporary barrier against the acid mucous. This, however, is of course only temporary, and it is necessary either to repeat the burnishing occasionally, or, better still, to have the patient bank about the necks of the teeth at night a paste containing a strong alkaline agent which will counteract the acid mucous.

□ □ □

THERE IS NOTHING NEW under the sun, except, of course, my own ideas, and perhaps a few of yours; yet it is true that everything is new to a man the first time he thinks of it, or the first time he hears of it. Dr. Brittain, of Boston, says that the following method of repairing a broken facing on a bridge is at least new to him. Perhaps it may be to others. No harm to print the Dear Old Method once more, anyway. The old jokes are always the best jokes. Guess that is why they get old. The bad jokes die "aborning."

□ □ □

"TO REPAIR FACING broken from a bridge, take a square-edged carbundum engine wheel and cut a slot in the backing. Bevel the edges on each side of this slot. Fit the backing till satisfactory and then attach pattern wax over the pins; force into the beveled slot, remove and cast gold direct to the facing. This gives a facing with a gold slab at the back, which will slide nicely to place and when cemented will be a firm attachment."

□ □ □

SOMETIMES THIS is true, and sometimes it is not. Once in a while that facing will come out checked. Then, if you have no other that just matches, you can begin another hunt for another facing.

□ □ □

A VARIATION of the above method is to slip two little platinum tubes over the pins before adding the pattern wax. Then when the pattern has been made the wax can be removed from the tooth and cast separately, after which it may be cemented to the facing, and that in turn cemented to the backing.

A VOICE FROM THE OTHER END of the table cries out: "Why not
 ❖ make the holes in the old backing in the first place and just cement the facing to place and be done with it." Bravo! Likewise, "Good Boy!"
 ❖ It has been done successfully. If you are skilled enough to grind the new facing to place, you can either do as the Voice suggests, or as Dr. Van Woert recommended long ago. After drilling out the old pins, connect the two holes, bevel the sides mesially and distally, and then when setting the facing force the two pins in opposite directions and pack in a little amalgam while the cement is still soft. A facing can be replaced in this manner at a single sitting, and if well done is a permanent operation.

□ □ □

DR. LOUIS H. GILBERT, of Rochester, N. Y., describes a method of cutting sensitive cavities with less pain. He says: "Up to the middle of last August I had administered nitrous-oxide and oxygen for painless operating more than a hundred times. Since then I have needed it but four times. Concluding that the major part of the pain is produced by the frictional heating up of the bur, I tried having my office girl pour a stream of cold water upon the bur while I operated, the saliva ejector drawing off the surplus water. I think also that the tooth, when chilled, conducts sensations less readily, as is demonstrated with the ether spray. I have been advised to color the water that the patient may receive the suggestion that a pain preventing agent is in use. This is probably a good idea, and no doubt suggestion plays a large part in all our work."

□ □ □

THE ABOVE REMINDS ME of so many things I hardly know whether
 ❖ there is time to tell all of them. That is the beauty about this talking
 ❖ Around the Table. One idea leads to another. First, then, the scheme of having the office nurse flow water on the bur. That reminds me
 ❖ that I once had my teeth cleaned by Dr. Taggart. He did not use pumice, but powdered sillex; and, by the way, I have used sillex ever
 ❖ since. It is more rapid than pumice and tastes less like "dirt," if you
 ❖ get my idea. Dr. Taggart would mix his sillex with water, to the consistency of thick cream, and his nurse would suck this into the cut off
 ❖ nozzle of a chip-blower, and then drop it onto the teeth as Dr. Taggart
 ❖ signaled for it. Whether using engine brush, rubber cup or hand polishers, this saved time for the dentist.

□ □ □

ANOTHER LITTLE METHOD of which Dr. Gilbert's proposal reminds me
 ❖ is accomplished with a device constructed by Dr. Van Woert. By the way, that Van Woert person has a lot of good ideas. In this particular
 ❖ case he has a tiny metal tube soldered to his handpiece in such a manner that the end of the tube is directed toward the bur. To the other end
 ❖ of the metal tube is attached a small rubber tubing leading to the compressed air outfit. When using the bur, the compressed air is turned on
 ❖ and a stream of cold air keeps the bur and tooth cool and the cavity
 ❖ clear of bur dust.



Around the Table



IN REGARD TO SUGGESTION, I am reminded of several things, but it

- ❖ is too late to go into that now, as I find that I have overlooked two
- ❖ communications which should have been read to the Club last month.
- ❖ However, they are just as good now. The first is from a Massachusetts
- ❖ dentist, and is good reading. But he asks me not to mention his name
- ❖ if I quote from him. I suppose because he calls himself an Average
- ❖ Dentist. According to my view, he is much above the average.

H H H

"I HAVE BEEN READING with considerable interest your long-distance
❖ discourse in the current 'Items of Interest' on the subject of root canal
❖ fillings. Like many others, I feel considerable interest in the subject
❖ and in the expressions of the men whom we regard as leaders in the
❖ profession on the subject.

H H H

"NOW, DOCTOR, DON'T YOU THINK that there is such a thing as edu-
❖ cating the public to a point beyond its own welfare? Just suppose that
❖ a patient of Dr. Hartzell's, or some one of the others you quote, were
❖ to be in a position where it was necessary to secure the services of a
❖ dentist with the least possible delay. And, further, that that dentist
❖ found a dental pulp which in his judgment required extirpation, and that
❖ he removed that pulp and filled the root canal according to the best of
❖ his skill and experience, and then dismissed that patient as having had
❖ the necessary service performed, what, in your judgment, would be the
❖ verdict of that patient who had been denied the distinction of a skia-
❖ graphic receipt of work done?

H H H

"OF COURSE, THE X-RAY evidence is conclusive, and theoretically should
❖ furnish the record of completed work, but being in business on the same
❖ street as Dr. Average Dentist I feel a measure of interest in the answer
❖ this discussion will furnish him.

H H H

"I WONDER IF DR. HARTZELL really finds a perfect root canal filling
❖ indicated on his every skiagraph. If he does, I would be very glad to
❖ close my office for a few weeks and sit at his feet and be taught.

H H H

"I REMEMBER THE LECTURES we received in my freshman and junior
❖ years on the 'technic' of root canal fillings. Those were the happy
❖ days—not. I have seen numberless teeth set in a suitable holder, drilled,
❖ broached, explored, probed and otherwise manhandled; then filled with
❖ a pasty antiseptic mixture and the scene of operations marked with a
❖ gutta-percha skewer that was supposed to reach to the 'apical foramen'
❖ and for all time to 'prevent infection from infecting the alveolar process.'
❖ Successfully working this answer into a given place in an examination
❖ some months later invariably resulted in the student being accorded
❖ a 'rank of 100 per cent.'

H H H

"IN THOSE DAYS IT ALL sounded well. In the college clinic this pro-
❖ cedure was followed, because somebody originated the idea in the year
❖ 1845, and why change?



Items of Interest

"SOME OF THOSE TEETH laid around my laboratory locker till cleaning-
❖ up time at the end of the senior year. In the meantime they had a
❖ chance to dry out some, likewise to shrink, and some few improved the
❖ opportunity and split more or less the full length of the root, and what
❖ do you suppose was revealed? Well, some of those roots, filled under
❖ expert supervision, theoretically perfect and ranked 100 per cent., were
❖ found to be just half filled; some were three-quarters filled and some
❖ were almost filled to the aforementioned apical foramen.

❖ ❖ ❖

"IN THOSE DAYS I studied at dentistry; in these days I am studying den-
❖ tistry. Being an average dentist, and not having incentive to install an
❖ X-ray outfit, my work is not checked up after each operation.

❖ ❖ ❖

"PERHAPS THIS IS WHY I am an average dentist. But I do feel that I
❖ invariably measure up the requirements of a given case and sometimes
❖ to a little more than the requirements.

❖ ❖ ❖

"ONE OF THE THINGS we were never taught as budding dentists was
❖ what we could not do. No dentist ever has or ever will be able to
❖ insert a gutta-percha point, of the smallest size made, into a root canal
❖ one iota smaller than that point. If he thinks just a little bit he will
❖ discard the only alternative, enlarging, for the reason that drilling can
❖ only be done in a straight line, and root canals do not conform to that
❖ specification.

❖ ❖ ❖

"AS MATTERS STAND, what have we to offer? The best dentistry, opera-
❖ tive and mechanical, is but an attempt to tinker or patch up something
❖ that through wear or misuse is not satisfactorily performing its function.
❖ Where therapeutics is involved, we are going one step beyond the purely
❖ mechanical requirements of the case; but at no time do we lose sight
❖ of the end we are working for, something mechanical and well within
❖ the scope of Nature's original planning. This is what we offer, it is
❖ what the public expects, and what the public generally gets, within the
❖ limits of the individual dentist performing the service. It is done in
❖ good faith, it is offered in good faith, and the procedure is justified by
❖ the fact that it has been taught, demonstrated and practiced since 1845.
❖ Can we in justice to ourselves now admit that for this space of time we
❖ have been groping in the dark, that as surgeons we have been sustained
❖ by faith and by faith alone? The X-ray says that our faith is a mighty
❖ slim support, so slim 'that we won't show our finished work to our
❖ patients.'"

❖ ❖ ❖

"NOW, DOCTOR, YOU HAVE STARTED something, and in justice to the
❖ men who are devoted to a practice within the three or five-dollar limit,
❖ I think you are morally bound to carry the discussion to a point where
❖ the finding of the discussion will square with the conscience of the
❖ operator who is trying the best he knows how to do the right thing,
❖ who cannot check up finished work, and who yet realizes the force of
❖ the objection raised against his unchecked work."



I DO NOT SEE HOW I can do better than to follow this with a communication from Dr. W. T. Jacobs, of Muskogee, Okla., who writes as follows: "I am always interested in your Around the Table talks, and after reading your long-distance talks with high authorities, I venture to offer my solution of the problem, at least as it applies to my own case. I am an unknown dentist in this far Southwest, but my experience and problems I believe cannot differ much from those of the average dentist. I am interested deeply in my dental work, making it my life study, and being so interested I naturally do all dental work, each operation, to the best of my ability, watching each mouth for good results and trying to improve each day by experience gained from previous operations done, whether amalgam filling, inlay, crown or root canal filling.

■ ■ ■

"I FIND THAT NINETY PER CENT. of new business comes through pleased patients. Therefore, from a purely business standpoint I cannot afford to not do a canal operation to the very best of my ability, that it may prove satisfactory to my patient and convert him into a friend. But most of all, there is the irresistible desire to fill that canal as nearly perfectly as human skill may fill it, that I may have the satisfaction of knowing that I have done my best, and that my best fairly averages up to the other man's best.

■ ■ ■

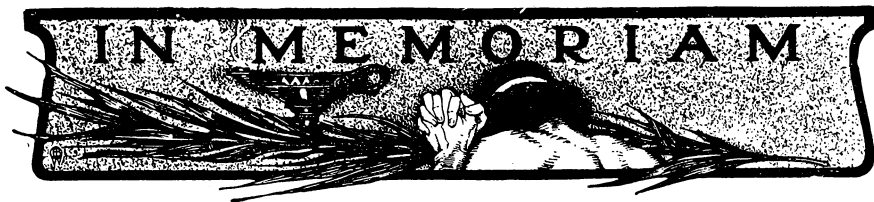
"LOOKING AT THE MATTER in this way, if a particular patient cannot pay a full fee, remember that your remuneration will come first from the knowledge that you have not shirked, which is the mental and moral profit; and, secondly, through others recommended to you by that satisfied patient, which is the financial and final profit.

■ ■ ■

"A TRULY PROFESSIONAL man can find no excuse within his own heart for slighting an operation, especially a money excuse. He who puts nothing into the world takes nothing out of it."

■ ■ ■

THOSE OKLAHOMA CHAPS have some good ideas, don't you think?



Dr. Faneuil D. Weisse.

Dr. Faneuil Dunkin Weisse, Dean of the New York College of Dentistry, died suddenly on Tuesday, June 22d, at his summer home in Gedney Farms. Dr. Weisse was 72 years of age.

He was born in Watertown, Mass., and was a descendant of Peter Faneuil, who donated to Boston the historical building, Faneuil Hall. Dr. Weisse was the son of Dr. John A. Weisse, philologist. His father tutored him for twelve years, giving him an education which enabled him to enter the medical college of New York University, from which he was graduated in 1864.

Dr. Weisse, who was one of the founders of the New York Dermatological Society and the American Veterinary College, began his career as a medical educator under Dr. Valentine Mott, Professor at the New York University Medical College, in 1863. Dr. Weisse became Lecturer and Clinical Professor of Dermatology at the university in 1865. From 1874 to 1875 he was Professor of Surgical Pathology, and for thirteen succeeding years he was Professor of Practical and Surgical Anatomy.

Following his graduation from college, Dr. Weisse was Professor of Surgical Pathology at the New York College of Veterinary Surgeons. For almost half a century he was Professor of Anatomy, Surgical Pathology and Oral Surgery at the New York College of Dentistry. He was chosen Dean of the College in 1897.

In 1886 Dr. Weisse completed a volume known as "Practical Human Anatomy," which was the result of seven years of labor and research.

Dr. Weisse married twice. His first wife, who was Miss Mary Elizabeth Suydam, daughter of Mr. Henry Suydam, of New York, died about seven years ago. In August, 1910, Dr. Weisse married Mrs. George H. Ripley, daughter of Mr. William Churchill, of this city.

